June 2015

Tewksbury Rail Trail Feasibility Study

Tewksbury, MA

Prepared by:
FAY, SPOFFORD & THORNDIKE

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EXECUTIVE SUMMARY

The Tewksbury Rail Trail (TRT) is a proposed shared-use trail (or rail trail) through the Town of Tewksbury utilizing the former railroad Right-of-Way (ROW) previously owned by PanAm. The goal of the TRT project is to create a network of safe, accessible routes for non-motorized modes of transportation within the Town and to connect to regional trail systems in the future (Figure 1).

This Feasibility Study evaluates the former rail corridor from the Lowell/Tewksbury town line southeast to the Tewksbury/Wilmington town line, and includes a spur extending north to the Tewksbury/Andover town line, a total of approximately 7.5-miles. The ownership and current use of the ROW varies along the former rail corridor.

Vision and Process

The Town of Tewksbury is a rural community with a small town quality and a strong commitment to recreation and open space. Tewksbury's geographic location provides convenient motorized access to two major highway routes, Interstates 495 and 93, and a number of minor arterial routes. The TRT Committee has been interested in providing an alternative means of travel to access points of interest on a local level with the potential for future regional connections. Already, the TRT Committee has connected with other trail organizations and gained support for adjoining trail systems. As envisioned, the TRT will enhance bicycle and pedestrian connectivity between the center of town, green spaces, commercial areas, and existing and proposed trail systems in Tewksbury and neighboring towns. Establishing a trail system in Tewksbury aligns with both Tewksbury's Open Space and Recreation Plan and Master Plan.

The TRT Committee was proactive in securing funds and bringing on a consultant team. Funding for the Study was appropriated at the Spring 2013 Town Meeting through local Community Preservation Act (CPA) funds and the vote at Town Meeting was indicative of residents' support for this project. In September 2014, the TRT Committee and Town of Tewksbury partnered with the firm Fay, Spofford & Thorndike (FST) to prepare this Feasibility Study. The goal of this study was to address key design and constructability issues related to the potential conversion of the former rail corridor into a shared-use trail including identifying potential alternative routes for local connections. The technical items addressed include, but are not limited to, trail cross section, surface material, parking and access, at-grade crossing treatments, and abutter mitigation measures. In addition, The Study also identifies the key activities and funding needed to advance the project in phases.

This study was prepared with a range of public input and direction. Members of the TRT Committee guided the process and engaged the community while constantly seeking new volunteers. Two public forums were conducted as part of the process for the community to attend. An Open House in December 2014 was held to gather information and was successful in gaining valuable input from over 80 community members in attendance. A Public Information Meeting was also held in March 2015 to present the initial study results for public comment. An interdepartmental coordination meeting was held with Public Works, Conservation, Engineering, Health, Planning, Police and Fire Departments. As part of the study, FST also met with a number of key abutters along the former rail corridor who were in favor of the project. These meetings and abutter support were important to determine the feasibility of route alternatives and the development of future trail connections.

Conceptual Design & Implementation

This Study determines that due to both land ownership and environmental constraints along the former rail corridor, development of the entire 7.5-miles as a shared-use path is not feasible. However, there are opportunities to develop the corridor utilizing three types of facilities attracting a cross section of users.

- Shared-use path or trail – A facility for non-motorized uses that meets accessibility requirements and is independently aligned and can be used for a variety of purposes including recreation, commuting and local travel.
- Greenway trail – A recreational facility through backcountry or other rural areas that is general an unpaved trail that serves hikers, mountain bikers, equestrians and other off-road users.
- Bicycle route or shared roadway – A bicycle route refers to use of normal roadway travel lanes by both motor vehicles and bicyclists.

Completing the project in its entirety would prove difficult and cost prohibitive. In addition, there are coordination efforts and subsequent agreements that need to be in place to allow certain portions of the project to advance. It is recommended that the project follow a phased approach to allow time to obtain the necessary approvals and secure project (design and construction) funding. The phased approach outlined in the Table 1 has the potential to serve users in the near term while exploring advancement opportunities and providing future connections.

The project goal is to secure construction funding through various grant programs and pursue other public (federal, state, local) sources. The TRT Committee is interested in pursuing local Community Preservation Act (CPA) funds and the potential to obtain state/federal project funding through MassDOT. The estimated construction costs listed in Table 1 include material and installation costs and assume the project will be publicly bid and constructed by an independent contractor. Another potential means to reduce construction costs would be to perform certain activities, such as trail clearing, with the assistance of volunteers or the Town's Public Works Department.

Table 1 Recommended Project Phasing Strategy

Phase	*Activity/Segment*	*Facility Type*	*Estimated Construction Cost*	*Additional Coordination*
1	Construct 10-foot wide shared-use trail between Capitol Avenue and the Senior Center using hot mix asphalt (1.75 miles)	Shared-use trail	$1,100,000	Access to ROW
2A	Construct trailhead parking area and interpretive elements at East Street and Maple Street	Parking area	$50,000	Access to ROW
2B	Create on-road bike route, directional signage and pavement markings from Maple Street to Shawsheen Street (1.2 miles)	Bike route	$16,000	Town Assistance
2C	Formalize and construct 10-foot wide greenway trail between Shawsheen Street and Regina S Drive using a compacted soft surface (0.3 miles)	Greenway trail	$125,000	Access to ROW Town Assistance
2D	Create on-road bike route, directional signage and pavement markings along Regina S Drive to South Street intersection (0.3 miles)	Bike route	$5,000	Town Assistance
2E	Create on-road bike route, directional signage and pavement markings from Maple Street trailhead along East Street to the Senior Center (0.7 miles)	Bike route	$10,000	Town Assistance
3	Explore shared-use trail alternatives between Maple Street and Shawsheen Street (1.0 miles)	Shared-use trail	Requires further study	Access to ROW Conservation Support
4	Explore greenway trail alternatives and formalizing existing foot trails between Maple Street and Andover	Greenway trail	Requires further study	Access to ROW Volunteer Support

Next Steps

Utilizing the technical items addressed in this study and obtaining additional information regarding the ownership status of the former rail corridor, the Town and TRT Committee will be able to make educated decisions regarding how to advance the project. The next steps of the project development process include:

- Conduct a title review of each parcel along the former rail corridor to determine accurate ownership
- Conduct additional outreach with abutters, residents, and departments/boards/commissions
- Pursue grant opportunities and funding sources to obtain design and construction funds

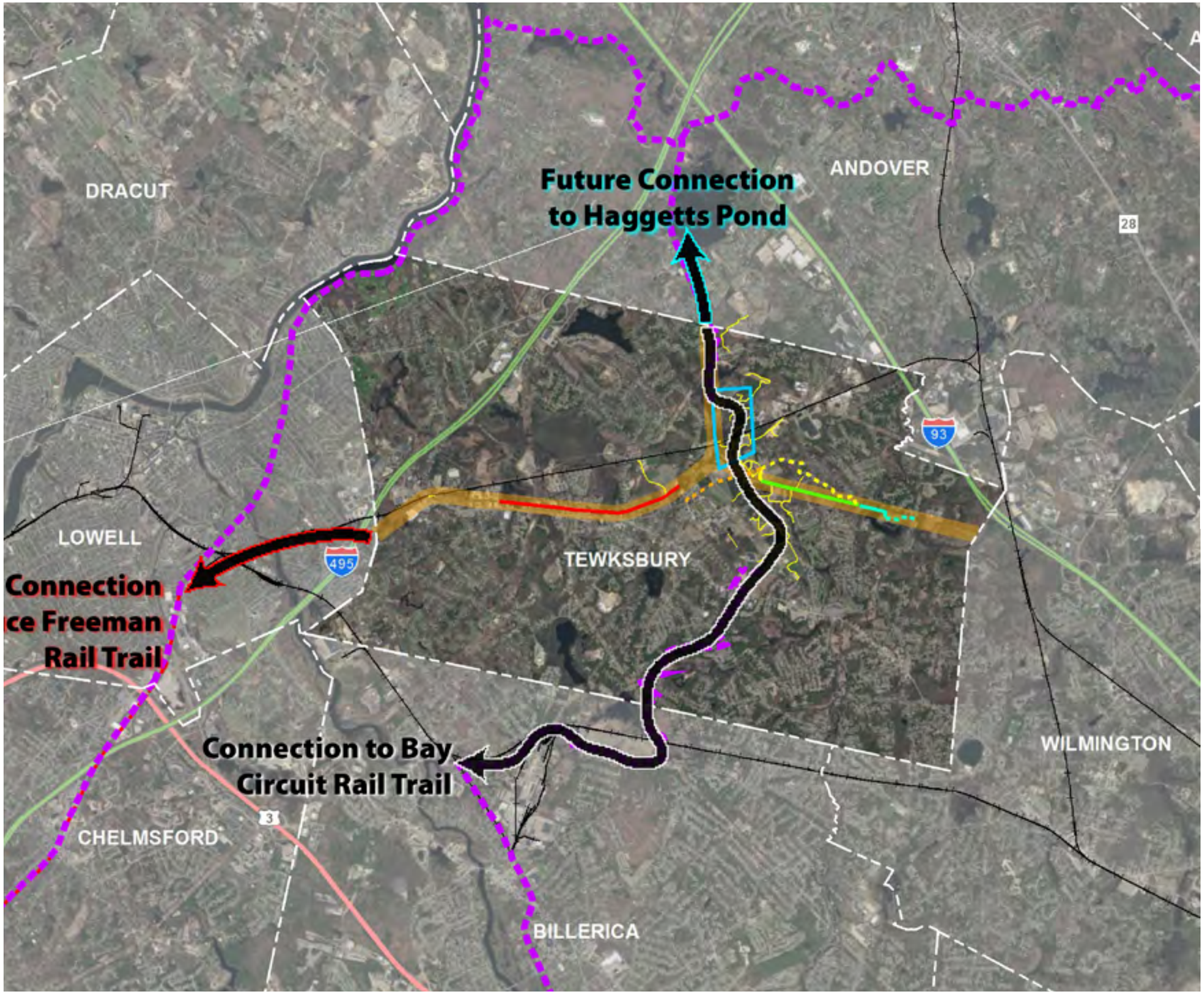


Figure 1 Regional Connection Map

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

1.0 INTRODUCTION

The Tewksbury Rail Trail (TRT) is a proposed shared-use trail (or rail trail) through the Town of Tewksbury along the former railroad Right-of-Way (ROW) corridor previously owned by PanAm. The former rail corridor is approximately 7.5-miles in length, extending through Tewksbury from the Lowell town line southeast to the Wilmington town line and spurring north to the Andover town line. The ownership and current use of the ROW varies along the former rail corridor. An overview map of the TRT corridor is shown in Figure 2.

The purpose of this Study was to evaluate the feasibility of converting the former rail corridor to a shared-use trail facility, identify other connection alternatives and recommend an alternative or combination of alternatives for the Town to consider for future development. In September 2014, the Tewksbury Rails-to-Trails Committee (TRT Committee) and Town of Tewksbury partnered with the consulting engineering firm Fay, Spofford & Thorndike (FST) to prepare this Feasibility Study. Funding for The Study was appropriated at the Spring 2013 Town Meeting through local Community Preservation Act (CPA) funds.

This Study was prepared with generally positive input from an engaged community participation program, including:

- December 2014 – Open House held at Tewksbury Memorial High School to gather community input
- January 2015 – Tewksbury interdepartmental meeting to gather town department input (Public Works, Conservation, Engineering, Health, Planning, Police and Fire)
- January 2015 – Met with key abutters along the former rail corridor to evaluate other connection alternatives
- March 2015 – Public Information Meeting held at Tewksbury Memorial High School to present initial study results for public comment

This Study discusses existing site conditions and key design and constructability issues related to the potential conversion of the former rail corridor into a shared-use trail. The Study also identifies the key implementation activities and funding needed to advance the project in phases. These elements of trail development are discussed in the following pages:

- ***Chapter 1, The Vision*** illustrates elements of a trail and the proposed trail concept.
- ***Chapter 2, Implementation Plan*** outlines implementation recommendations.
- ***Chapter 3, Project Funding*** describes potential funding sources.
- ***Chapter 4, Physical Inventory and Assessment of the Right-of-Way*** inventories the existing conditions and provides an analysis of the PanAm ROW.

1.1 The Vision

The creation of a shared-use trail facility is intended to provide non-motorized connections to places people want to go. Imagine a safe route to walk or ride your bike from home to Town Center, the baseball field, or a peaceful spot in the woods. A town-wide trail system will strengthen and enhance Tewksbury's neighborhood, business, civic, natural, and play areas. A trail system would not only connect neighborhoods locally, but also provide opportunity for future connections at a regional level. Potential regional connections include the Bruce Freeman Rail Trail through Lowell or Haggett's Pond in Andover.

Through the Town of Tewksbury's ***2003 Masterplan*** and ***2009 Open Space and Recreation Plan*** it has been determined that there is a need to provide improved pedestrian and bicycle access throughout Town. The Tewksbury community has voted to explore trail opportunities along the former historic Lowell & Lawrence and Salem & Lowell railroad corridors which cross through town. As envisioned, the Tewksbury Rail Trail will provide:

- Accessible, equal recreation opportunities for all Town residents.
- Improved bicycle and pedestrian access to and from the Town Center area.
- A trail network linking open spaces within Town.
- Future opportunities to connect to regional trail systems.

The Wamesit Indian

Former rail corridor

Tewksbury Town Common

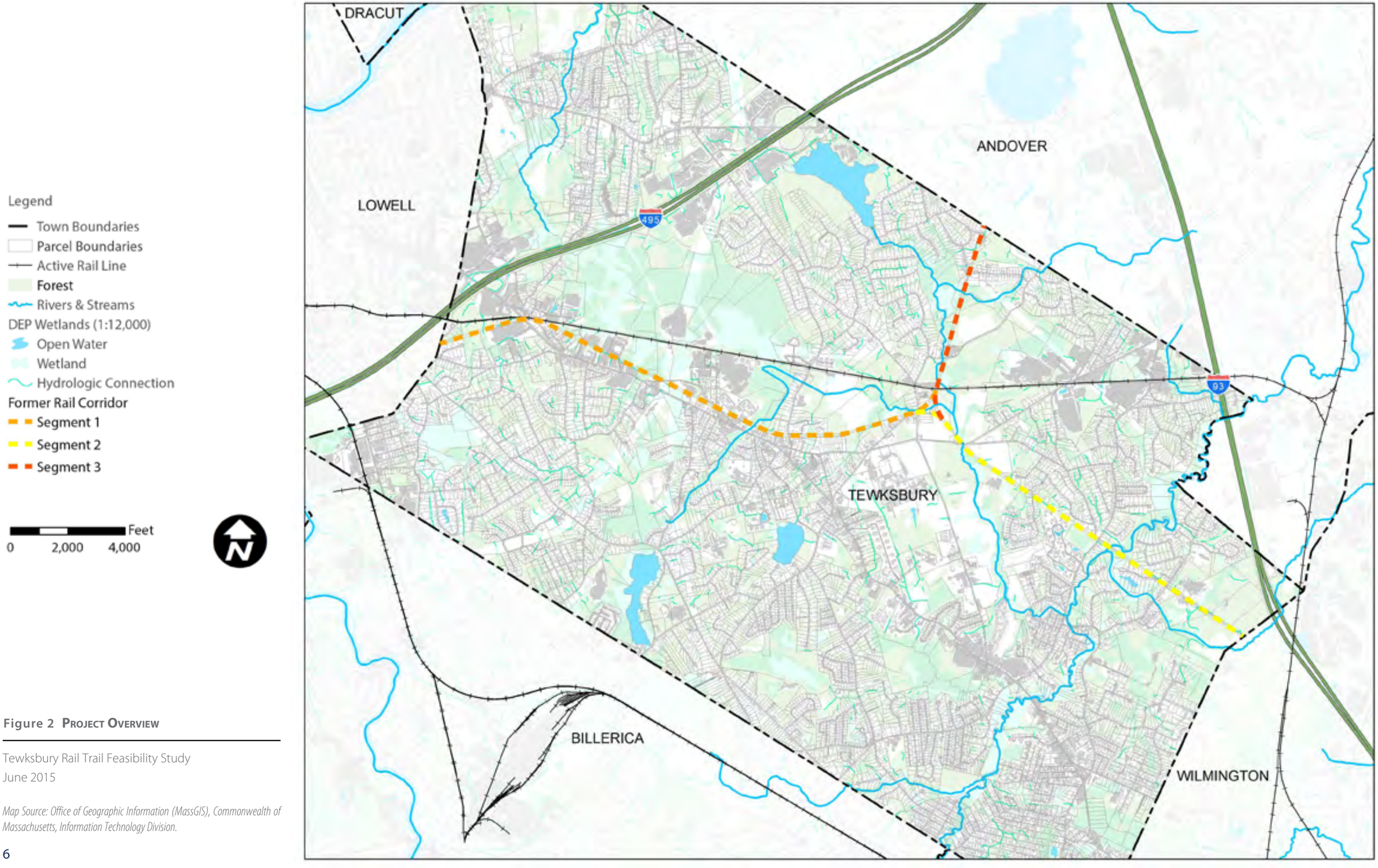


Figure 2 Project Overview

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

1.2 Trail Design Elements

This chapter addresses the following conceptual trail design elements:

- Trail type
- Trail cross section
- Trail profile
- Trail surface material
- At-grade trail/roadway crossing treatment

1.2.1 Trail Type

The proposed project will consist of the following proposed trail types:

- Shared-use path or trail
- Greenway trail
- Bicycle route or shared roadway

Shared-use path or trail: A shared-use path or trail (or rail trail) is a facility for non-motorized uses independently aligned for a variety of purposes including recreation, commuting and local travel. This type of facility is attractive to all ages and skill levels because of the separation from automobile traffic. In addition to bicycling, separate shared-use paths are used extensively for walking, running and in-line skating. As it is a shared-use facility, the more stringent pedestrian accessibility requirements for grades govern. Where these requirements cannot be met, a variance must be requested from the Massachusetts Architectural Access Board (AAB).

Key Design Criteria:

- 10 foot surface width (typical)
- 8 foot surface width in sensitive areas (minimum)
- 2 foot shoulders

  The shoulder is typically graded to a 1 vertical to 12 horizontal (1:12) to enhance proper drainage to prevent erosion and provide a recovery zone for trail users. Shoulder areas should be compacted, stabilized and designed to discourage their use as informal treadways.
- 2 foot minimum (3 foot ideal) clear offset from edge of trail to obstructions (i.e. tree, fence, sign, wall)
- 5 to 7 foot minimum separation from roadway or steep slope

  If this offset cannot be achieved, then a physical barrier such as a wood rail fence or dense shrubbery should be installed along the top of slope to protect trail users. In general, the greater the height of the drop-off, the greater the need for protection.
- 4.5% maximum running slope or grade (construction tolerance +/- 0.5%)
- 1.5% maximum horizontal cross slope (construction tolerance +/- 0.5%)

  The trail will need to be raised slightly above the surrounding ground and have a 1.5% cross slope in one direction to ensure stormwater drains off the trail surface. The direction of the cross slope should be established based on the natural drainage patterns at the site. A 1.5% cross slope (construction tolerance +/- 0.5%) is the same as a typical sidewalk and meets Americans with Disabilities Act (ADA) accessibility guidelines.

Greenway Trail: A greenway trail is a recreational facility through backcountry or other rural areas that is generally an unpaved trail that serves hikers, mountain bikers, equestrians and other off-road users. These facilities vary in width and are often designed for differing levels of accessibility. Although design guidelines for greenways are not as well established as those for other facilities, the trail should be designed to be accessible to users of varying abilities. Depending upon the funding source, a variance may be required from the Massachusetts AAB if accessibility guidelines cannot be met.

Key Design Criteria:

- Less defined design guidelines
- Width varies depending upon anticipated user types and intensity of use
- Should be accessible to users of varying abilities

Bicycle route or shared roadway: A bicycle route refers to use of normal roadway travel lanes by both motor vehicles and bicyclists. These facilities are also referred to as shared lanes or a shared roadway. "Share the Road" warning signs or "Bike Route" directional signage is typically installed along these facility segments (Figure 3). In addition, shared lane markings or "sharrows" can also be provided to identify the route and to indicate how far from the roadway edge bicyclists should ride. A detail of a shared lane marking is shown in Figure 3. Similar to bicycle lanes, this type of facility is also used mostly by bicyclists that are experienced in sharing roadways with motor vehicle traffic. They do not attract the variety of users and skill levels that a separated shared-use path normally attracts. Bicyclists traveling along these local roadways follow the same rules of the road as vehicles.

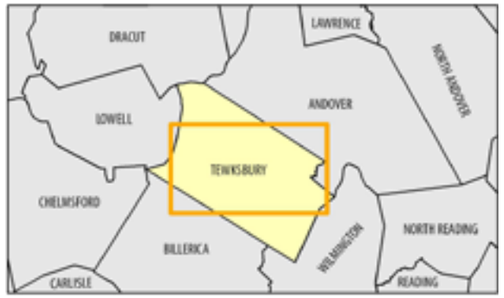
Key Design Criteria:

- Travel lanes at least 14 to 15 feet wide (preferred)
- Recommended for roadways with low speeds and low to moderate traffic volumes
- Grades less than 5% are desirable
- Maximum grades can range from 5% to 11% for lengths of 800 to 50 feet, respectively

The representative cross section locations along the former rail corridor are shown on Figure 4 and Figure 5 and include:

- Section A-A: Typical Shared-use Trail in Fill Section (Figure 7)
- Section B-B: Typical Shared-use Trail Adjacent to Parking Facility (Figure 10)
- Section C-C: Typical Shared-use Trail Boardwalk Section (Figure 15)
- Section D-D: Typical Shared-use Trail with Abutter Screening (Figure 16)
- Section E-E: Typical Shared-use Trail in Fill Section with Slope Stabilization (Figure 18)
- Section F-F: Typical Greenway Trail Section (Figure 19)

Figure 3 Example Signage and Pavement Markings for On-Road Segments



Study Area

Feet
0 10,000 20,000

Legend

- Town Boundaries
- Enlargement Sheets
- Active Rail Line
- Protected and Recreational Open Space
- Rivers & Streams
- Existing Trail
- Former Rail Corridor
- Segment 1

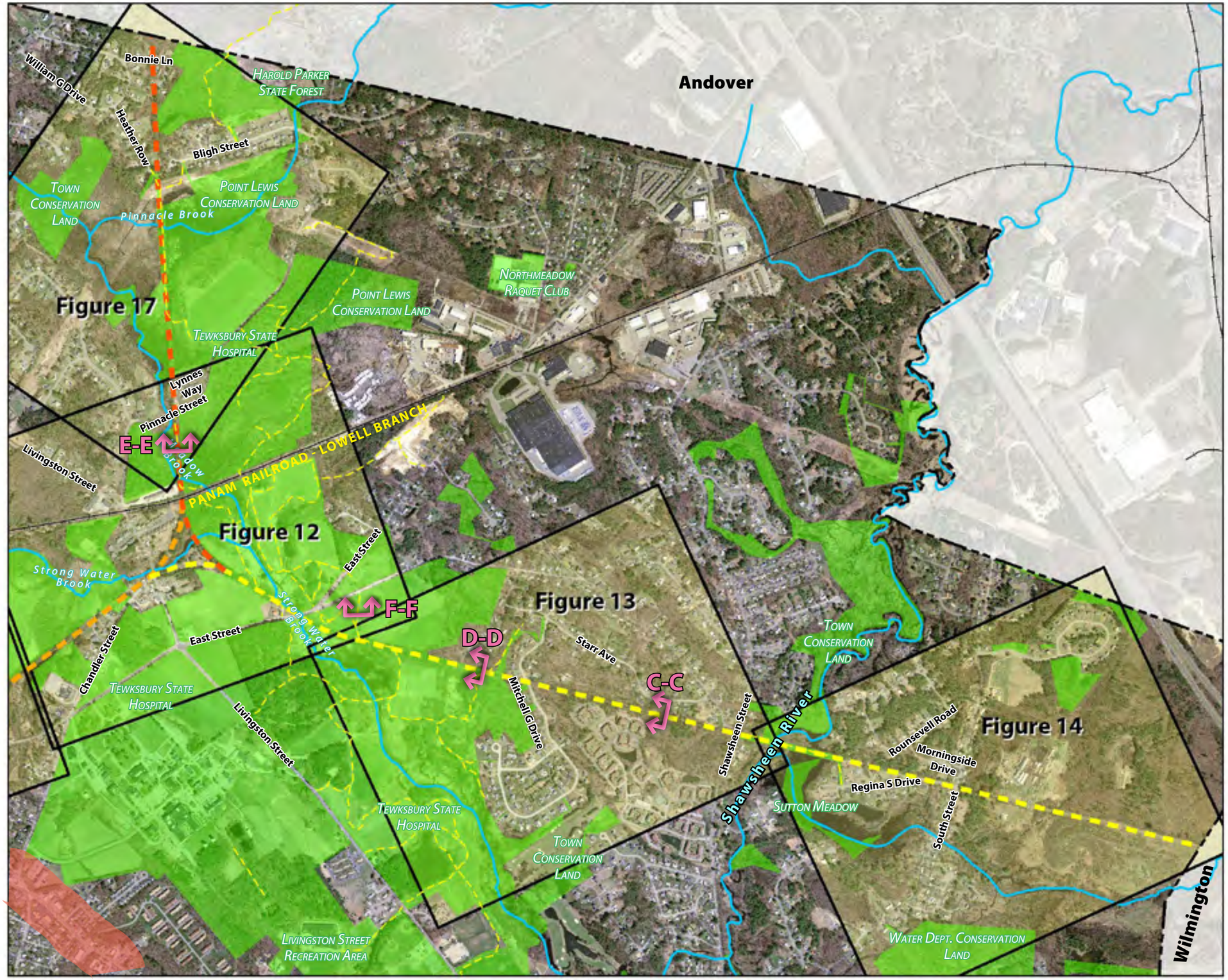
- Typical Trail Section Location
- Commercial Area

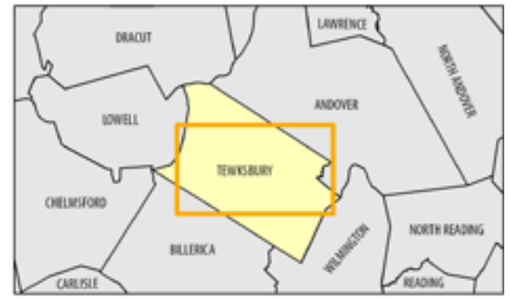
Feet
0 1,000 2,000

Figure 4 Project Corridor (West)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography





Study Area

0 10,000 20,000 Feet

Legend

- Town Boundaries
- Enlargement Sheets
- Active Rail Line
- Protected and Recreational Open Space
- Rivers & Streams
- Existing Trail

Former Rail Corridor

- Segment 1
- Segment 2
- Segment 3

Typical Trail Section Location

Commercial Area

0 1,000 2,000 Feet

Figure 5 Project Corridor (East)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

1.2.2 Trail Surface Material

Following track and tie removal, the existing subbase material including the railroad ballast (stone) will be graded to fill any voids then compacted and rolled. The next step is to install the base and top course materials, rolling and compacting between layers.

Any wet or organic subbase material should be removed to prevent uneven settlement of the base and top courses. Depending upon existing conditions, this may require installing additional depth of base course material to replace any unsuitable materials encountered during construction. The only way to confirm the suitability of the subbase material prior to the start of construction would be to conduct a geotechnical sampling program.

According to the *Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way; Shared-use Paths* issued by the Architectural and Transportation Barriers Compliance Board (Access Board), a trail surface must be firm, stable, and slip resistant to meet current ADA guidelines. Per the Access Board definitions "a stable surface remains unchanged by applied force so that when the force is removed, the surface returns to its original condition. A firm surface resists deformation by indentations." Based on this definition, a soft surface trail will not fully meet current ADA guidelines under all conditions. A soft surface trail is flexible when dry and when it becomes wet, the entire surface softens and is susceptible to deformation (i.e. rutting). The trail would need to be constructed with a stabilized granular surface or hot mix asphalt (pavement) to meet current ADA guidelines under all weather conditions. The following surface materials are commonly used in trail construction:

- **Granular Surface:** A granular surface is constructed using natural materials. The Wachusett Greenways Trail system and Topsfield Linear Common have been constructed using granular materials. A variety of coarse (crushed stone) and fine (stone dust) stone size variations can be used. The performance of a granular surface is dependent upon drainage patterns, intensity and type of use, and seasonal maintenance. When dry, a stone dust surface is flexible and when it becomes wet, the entire surface softens, thereby compromising its firmness and stability and thus ADA accessibility. These surfaces can be installed using the same spreader and compacting roller equipment used for small roadways/driveways. Granular surface trails require maintenance at least twice a year to address grading and erosion issues.
  - » **Stone Dust Surface:** A stone dust surface constructed on the existing track ballast (stones) is not recommended as there is the potential for uneven settlement over time.
  - » **Dense Graded Crushed Stone Surface:** This surface consists of a 6" compacted (minimum) dense graded crushed stone base / top course. The riding surface of this option is rougher as there are some coarser (larger) stones. Photo 1 shows an example of a weathered (1-3 year old) dense graded trail surface.
  - » **Stone Dust Surface Over Dense Graded Crushed Stone:** This surface consists of a 2" compacted (minimum) stone dust top course set on a 4" compacted (minimum) dense graded crushed stone base course. The smaller fines fill in the voids between the coarser stones which results in a smoother riding surface. Photo 2 and Photo 3 show an example of a stone dust trail surface.
- **Stabilized Granular Surface:** A stabilized granular surface consists of a natural stone dust surface combined with a stabilizing agent. Stabilizing agents can be in the form of a spray application or a material admixture. This agent, when added or applied to native soils, granite or crushed aggregate screenings, binds the aggregate to provide a firm natural surface that meets ADA guidelines. As the water evaporates from the mixture, the surface becomes hard and will resemble an asphalt surface. When dry, a stabilized granular surface is firm and when it becomes wet, the top ¼" of the surface softens. Stabilized granular surfaces can provide increased durability and erosion resistance over conventional granular surfaces. Repairs can be accomplished with a small mixer. The color, texture and appearance of the finished surface depend on the selected aggregate (e.g. tan, gray, red). There are many different products available including, for example, Stabilizer Solutions, PolyPavement, DirtGlue and Road Oyl. The Minuteman National Park Battle Road Trail and Massachusetts Department of Conservation and Recreation's (DCR) Charles River Reservation trails were constructed using a stabilized granular surface. Photo 4 shows an example of a stabilized granular trail surface.
- **Paved Surface:** Pavement or hot mix asphalt is the same surface material used on roadways and other rail trails such as the Nashua River Trail and Cape Cod Rail Trail. Asphalt is a durable material which, when properly constructed, requires minimal maintenance and has a long service life. For example, the Cape Cod Trail was recently resurfaced after more than 25 years of use. Surface and crack sealing can further extend service life. By its nature, asphalt meets ADA requirements for firmness, stability and skid resistance. Asphalt accommodates the widest variety of users and is suitable for all levels and abilities. Photo 5 shows an example of a paved trail surface.

The TRT Committee and Town of Tewksbury have indicated that their preference is to construct a hard paved surface trail along shared-use trail portions and a soft surface along the greenway trail portions. These recommendations are included in the conceptual cost estimates included as part of this Study (Chapter 2.3).

Photo 1 Trail surface, dense graded crushed stone (representative photograph)

Photo 2 Trail surface, stone dust over dense graded crushed stone, (Topsfield Linear Common during construction)

Photo 3 Trail surface, stone dust over dense graded crushed stone, (Topsfield Linear Common following construction)

Photo 4 Trail surface, Stabilized granular surface (Lizzy's Trail in DCR Bradley Palmer State Park)

Photo 5 Trail surface, paved (Cape Cod Rail Trail)

1.2.3 At-Grade Trail/Roadway Crossing Treatment

The former rail corridor crosses a number of local roadways at-grade. At each trail approach, the following safety improvements are recommended:

- Construct trail median treatment of a split entry into two sections separated by low landscaping or a curbed median
- Install signs along the trail to warn trail users of the approaching intersection
- Install signs and pavement markings along the roadway to warn motorists of the approaching trail crossing
- Install "ladder" crosswalk consisting of two parallel horizontal white lines with spaced white vertical bars to improve crosswalk visibility by motorists.
- Mount street name signs above stop signs at each crossing for user orientation

For the benefit of vision-impaired trail users, the Town should also consider installing detectable warning surfaces (tactile warning strips) at each crossing. Detectable warning surfaces consist of small truncated domes that are integral to a walking surface and that are detectable underfoot. This surface panel extends 2 feet minimum in the direction of pedestrian travel and the full width of the shared-use path. The recommended intersection treatment is shown in Figure 6.

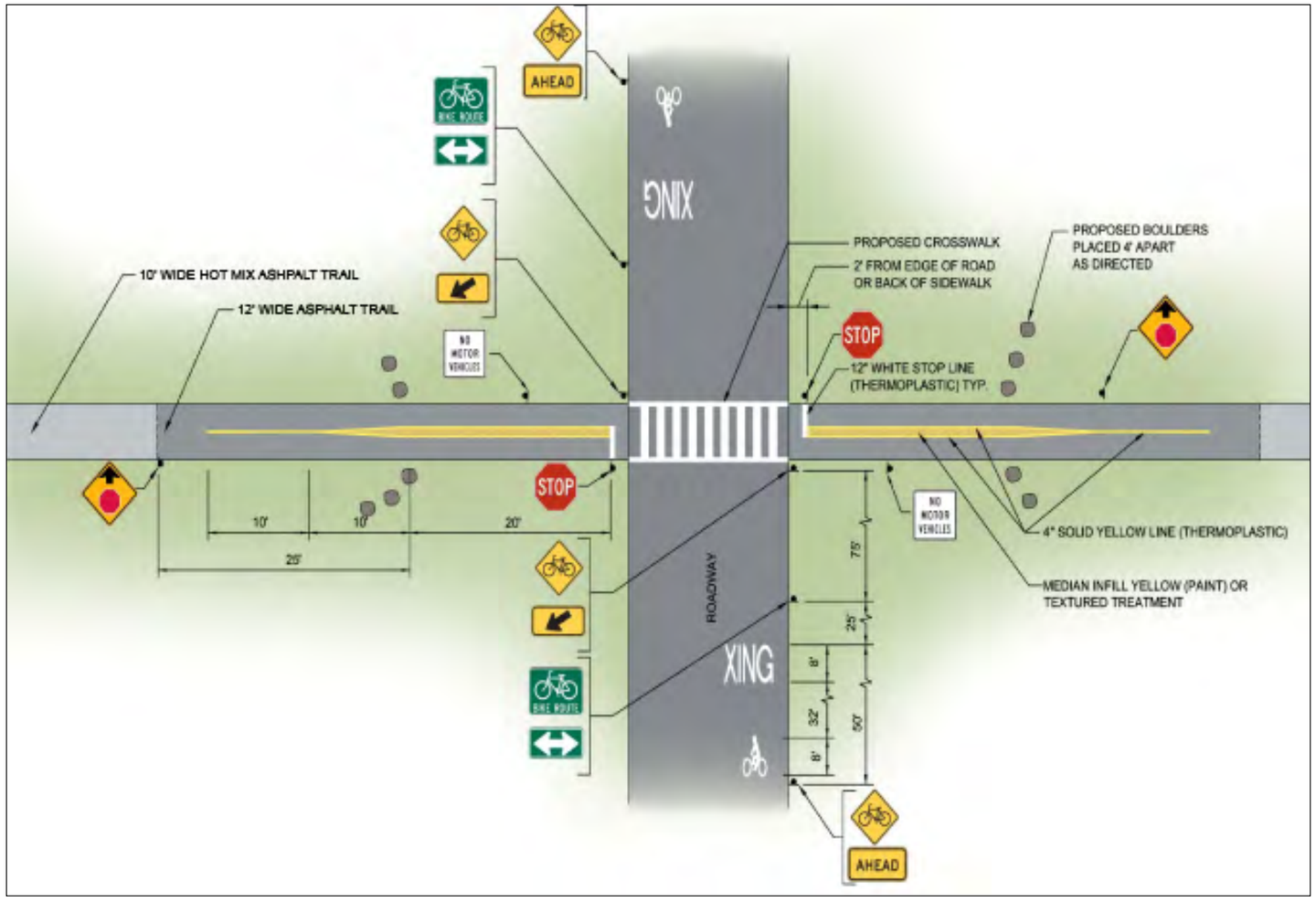


Figure 6 Typical At-Grade Trail Crossing Layout

1.3 Conceptual Trail Design

Developing a combination of shared-use trails, greenway trails, and bicycle routes along/ near the former rail corridor could attract a variety of users.

As part of the Study effort, approximately 7.5-miles of former rail corridor were evaluated to determine which sections were achievable for development of a shared-use trail. The conceptual design has been organized into three project segments for discussion purposes:

- Segment 1 – Lowell city line to Tewksbury Senior Center (3 miles)
- Segment 2 – Wilmington town line to Tewksbury Senior Center (2.8 miles)
- Segment 3 – Andover town line to Tewksbury Senior Center (1.7 miles)

Segment 1, (Figure 8, Figure 9, Figure 11 and Figure 12), extends from the Lowell city line east to the Tewksbury Senior Center, a distance of approximately 3-miles. The majority of Segment 1 parallels Main Street (Route 38) to the Town Common and then branches off to parallel East Street to the terminus at the Tewksbury Senior Center. This segment offers the best opportunity to connect to the commercial area of Tewksbury, as the alignment parallels Main Street. The former rail corridor within Segment 1 varies in land ownership made up of sections retained by PanAm, private utilities, and private ownership.

Segment 2, (Figure 12, Figure 13 and Figure 14), extends from the Wilmington town line west to the Tewksbury Senior Center, a distance of approximately 2.8-miles. Segment 2 crosses five intersections providing access to the trail for a number of residential neighborhoods. The former rail corridor within Segment 2 varies in land ownership between private and public entities.

Segment 3, (Figure 12 and Figure 17), extends from the Andover town line south to the Tewksbury Senior Center, a distance of approximately 1.7-miles. Similar to Segment 2, this section of corridor has the potential to provide trail access for a number of residential neighborhoods in North Tewksbury, though the majority of this segment is privately owned.

To establish the corridor's feasibility, it is critical to evaluate which sections successfully meet the project goals, line up with the community needs and have the potential to be implemented in phases. The ability to implement the phases of this project will require commitment from key project partners and securing the necessary design and construction funding. Based on a review of existing conditions, future development plans and infrastructure improvement projects along and adjacent to the former rail corridor, developing the entire 7.5-miles of former railroad corridor as a shared-use trail is not feasible. However, there are opportunities to develop the corridor utilizing the three types of facilities discussed in 1.2.1 attracting a variety of users.

1.3.1 Segment 1 – Lowell city line to Tewksbury Senior Center

Segment 1 extends from the Lowell city line east to the Tewksbury Senior Center, a distance of approximately 3-miles. Pending additional coordination at specific points along this segment, it appears feasible that a continuous section from Capitol Avenue to the Senior Center (approximately 1.75 miles) can be developed as a shared-use trail facility. This stretch would consist of a 10-foot paved surface width, five at-grade roadway crossings and two short on-road connections. The following describes Segment 1 and includes both the constraints of the segment and conceptual design of the feasible section.

Main Street (Route 38) Underpass: The former rail corridor extends under Main Street (Route 38), a Rural Minor Arterial connecting Tewksbury to Lowell (Figure 8). At this underpass, the corridor runs directly adjacent to the active PanAm Lowell Branch for approximately 900 feet. As shown in Photo 6, the Lowell Branch consists of a double railroad track from Lowell continuing under Main Street where it transitions to a single railroad track. In addition there is a large embankment built up against the south abutment of the underpass, shown in Photo 7. Constructing a shared-use facility directly adjacent to an active rail line presents challenges in safely accommodating both users and modes of transportation. Removal of this embankment, an assessment of the existing abutment, and coordination with PanAm regarding co-existence with the active Lowell Branch would be necessary to determine the feasibility of a future connection to Lowell.

The Commercial Area (paralleling Route 38): Main Street (Route 38) is the main thoroughfare through Tewksbury, running east west, the entire length from Lowell to Wilmington. The majority of businesses in Tewksbury reside on Main Street and providing accommodations to these businesses for other transportation modes would be a benefit to not only the trail users, but these local businesses. The corridor parallels the north side of Main Street from Old Main Street to North Street, a distance of approximately 9,500 feet (Figure 9).

There are a number of culvert crossings along this section of the corridor. Field reconnaissance efforts were not able to indicate whether all are functioning properly and to capacity. Further evaluation of each culvert's specific condition would occur during the trail design phase. A typical section at this location is shown as Section A-A in Figure 7.

Some low-lying areas adjacent to the former rail corridor have a wetland system or existing drainage swales. Due to a lack of maintenance, sections of these swales retain standing water following precipitation events. Once these swales are cleaned as part of trail construction activities, the original drainage patterns of the site will be restored and these areas will outlet to the existing low points at the culvert crossings beneath the ROW.

Photo 6 Lowell Branch double railroad track to Lowell

Photo 7 Main Street (Route 38) Underpass

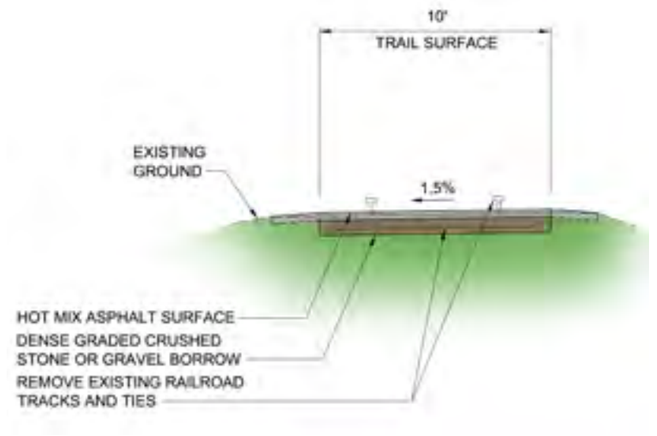
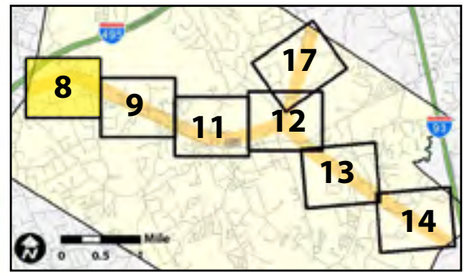


Figure 7 Section A-A: Typical Trail in Fill Section



Map Figure Number Key

Legend

- Former Rail Corridor
- Town Boundaries
- Parcel Boundaries
- Active Rail Line
- Protected and Recreational Open Space
- Corridor Culverts
- Existing Trail

DEP Wetlands (1:12,000)

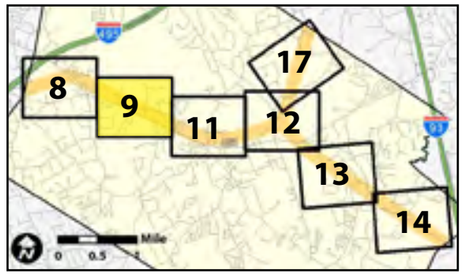
- Open Water
- Wetland
- Hydrologic Connection
- Future On-Road Facility

0 400 800 Feet

Figure 8 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography



Map Figure Number Key

Legend

- Former Rail Corridor
- Parcel Boundaries
- Active Rail Line
- Protected and Recreational Open Space
- Corridor Culverts
- Wetland
- Hydrologic Connection
- Proposed Shared-Use Trail
- Proposed On-Road Facility
- Future On-Road Facility
- At-Grade Crossing
- Trailhead/Parking Area
- (S) Signalized Crossing

0 400 800 Feet

N

Figure 9 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

Great Swamp
Potential Future Trail Connection
PANAM RAILROAD - LOWELL BRANCH
Wamesit Lanes
Main Street
Capitol Ave
(S)
(Formerly) Golds Gym
Power Company Road
Existing Power Company Road Corridor Crossing
TRAIL X-ING
Tewksbury Shopping Center
Old Boston Road
Jimbo's Roast Beef & Seafood
38
Washington Street
Sooner Lube
TMFCU
Main Street
Example Parking Area
Existing Rail Bed
Town Conservation Land

During the public participation process, potential ownership restrictions were disclosed regarding a few parcels immediately west of Capitol Avenue along the former rail corridor. In order for the town to obtain the necessary rights to all property allocated for the development of a shared-use trail, property research, a title review and negotiations will need to take place to determine accurate ownership. Extending the shared-use trail west along the former rail corridor should be revisited once the title review of the corridor has been completed. An overview summary of the property agreement process can be found in 2.2.1.

Due to the potential ownership constraints through the westernmost portion of the Commercial Area and for the purposes of this Study, a logical terminus for Segment 1 would be at Capitol Avenue. According to infrastructure improvements being performed by the Town, the intersection of Capitol Avenue at Main Street is proposed to be signalized with a pedestrian crossing. Constructing a signalized crossing at this location would allow pedestrians and cyclists to safely cross Main Street with access to parking and a trailhead at the existing parking area on the south side of Main Street.

Main Street businesses west of Capitol Avenue could be accessed by users traveling along or adjacent to Route 38 with potential future infrastructure upgrades in Town to ensure safe contiguous accommodations for pedestrians and cyclists. As the former railroad corridor intersects with Capitol Avenue approximately 400-feet north of the Main Street intersection, users would access the shared-use trail via an on-road bike facility marked with pavement markings and signage.

Halstead Tewksbury and 11 Old Boston Road Apartment Complex: The Halstead Tewksbury and 11 Old Boston Road developments are located on the former rail corridor (Figure 11). The shared-use path could be constructed through these properties, along the edge of the parking behind 11 Old Boston Road (Photo 8) and through a portion of the parking lot owned by Halstead Tewksbury (Photo 9).

The parking area behind 11 Old Boston Road lies on the former rail corridor. Adjacent to the parking row is a grassed area approximately 24-feet wide. Continuing the shared-use trail through this property would require the installation of a wood rail fence guardrail along the edge of the parking to discourage vehicles from encroaching on path users. A typical section at this location is shown as Section B-B in Figure 10.

East of 11 Old Boston Road the shared-use trail continues through Halstead Tewksbury's driveway to the parking area on the eastern side of the property. The driveway is low-volume and mainly used by the residents of these properties. With a series of paved path connections, painted crosswalks and signage, pedestrians and cyclists could access the corridor as it continues to the east. Routing the shared-use trail through these properties would be determined pending future meetings and coordination with each of these developments.

Utility Corridor: An approximate 1,300-foot section of the former rail corridor, beginning just west of the Police Department building and extending through to North Street, currently consists of a pair of parallel utility poles (Figure 11). Based on a preliminary review of the former rail corridor ROW ownership, this section is owned and operated by a private utility company and contains a National Grid facility. It is common for former railroad corridors to become the home for utility facilities as they are typically long, linear, cleared corridors. Though it would not be out of the question to develop a shared-use facility through this section, it would require future coordination with National Grid, including confirmation that the proposed trail design aligns with their requirements.

The Town would be responsible for engaging in an agreement with National Grid to utilize the corridor for recreational trail use. While at this time there is not a direct fee associated with the agreement between the Town and National Grid and the timeframe of this process is iterative and unique to each project, National Grid's requirements typically include but are not limited to the following:

- Requestor must submit a full set of review grade plans in order for National Grid to properly evaluate any agreement requests. (For example, this submission would include: plans and profiles showing existing and proposed conditions; the location of all facilities with pole numbers labeled on both plan and profile view; details of proposed bridges, landscaping, and pavement design; plans showing any access points along the corridor; and plans showing any additional work to be done within their ROW)
- All wire elevations within the project area are to be surveyed and shown on the review plans to confirm that vertical clearances to energized lines meet code requirements.
- The proposed trail and shoulders would need to be built to withstand AASHTO H20 Wheel loadings and tracked vehicles so as to accommodate National Grid's maintenance fleet. Other than National Grid vehicles, no other motorized vehicles would be allowed along the corridor.
- No equestrian use would be allowed along the corridor.
- A 3-foot horizontal clearance is typically preferred between the proposed trail and any structures (including anchors or guy wires).
- National Grid will not be held responsible for any damage, maintenance, or costs associated with trail construction (i.e. relocation/raising of any ground structures, etc.).

In addition to the above requirements, National Grid typically reserves the rights to:

- close the trail if needed for their operations/activities;
- terminate the agreement in the event that the trail or activities are unsafe or hinders National Grid's ability to conduct business;
- add, delete or change their terms and conditions at any time.

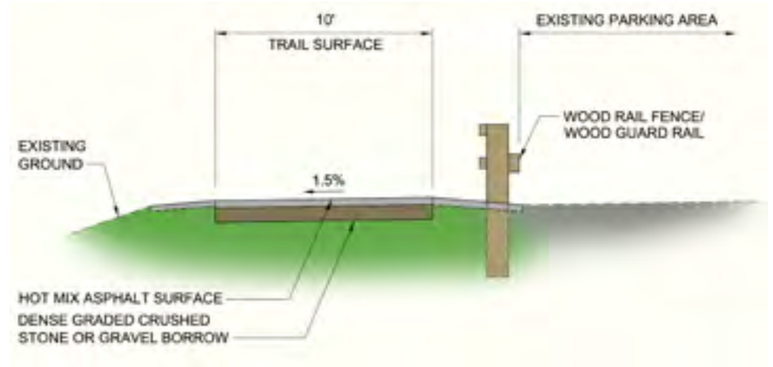


Figure 10 Section B-B: Typical Trail Adjacent to Parking Facility

Photo 8 11 Old Boston Road Apartment Complex former rail corridor at parking area

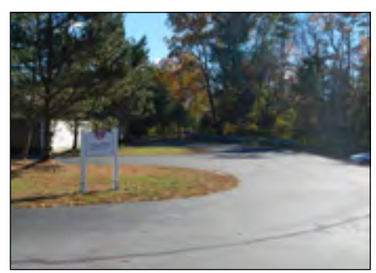


Photo 9 Halstead Tewksbury driveway to parking area

Tewksbury Cemetery: The Tewksbury Cemetery is a privately owned non-profit and while the former rail corridor runs along the backside of the cemetery, this land is currently privately owned. (Photo 10) As part of the Study, the TRT Committee met with the cemetery owners to discuss plans for future development and if the cemetery would entertain the idea of a shared-use trail along this portion of their property. Based on feedback, there is support for the trail's development pending it does not interfere or hinder cemetery operations. The cemetery would be amenable to future discussions and coordination regarding the trail development, and as a means to not impact the operations on their property it would be preferred to route the trail just north of the former rail corridor onto Tewksbury State Hospital property (Figure 11). Routing the trail onto State Property would require future coordination on a both a local and state level. Gaining approval to utilize this land would need to be applied for through the Division of Capital Asset Management and Maintenance (DCAMM), whom is responsible for managing this property. Directing the trail to the eastern side of the cemetery would provide an off-road connection north to Frasca Fields and east to the Senior Center, shown on Figure 12.

At-Grade Roadway Crossings: Within the feasible 1.75-mile section of Segment 1, the corridor crosses five local roadways at-grade.

- **Capitol Avenue:** Capitol Avenue (Photo 11) is a dead end road located off Main Street. This road is low-volume, servicing an industrial area located behind the commercial businesses along the north side of Main Street. There is no posted speed limit and speeding didn't appear to be a problem during field visits. Based on the horizontal and vertical alignment of this road, sight distance appears acceptable, though could be improved with roadside vegetative clearing at the crossing.

  Currently this intersection with Main Street is unsignalized but now under design to be signalized with a pedestrian crossing. The addition of this signal and crossing will allow pedestrians to safely access the south side of Main Street and the businesses residing there. The addition of a safe crossing on Main Street would allow trail users the opportunity to park at the plaza on the south side of Main Street and access the trail safely.
- **Old Boston Road and Power Company Road:** Old Boston Road (Photo 12) and Power Company Road (Photo 13) are low-volume roads that intersect the corridor and each other north of Main Street near the power lines. Although these roads are low volume, they are often used as a 'cut-through' for vehicles accessing the abutting residential properties. Due to speeding being a factor at times, it is recommended that an advisory speed limit be posted in advance of the trail crossing on each of these roads.
- **Old Boston Road and Archstone Avenue:** Old Boston Road and Archstone Avenue are low volume roadways that service the housing developments at Halstead Tewksbury and 11 Old Boston Road. As the former rail corridor intersects these streets at a skewed angle, the crossing could be formalized to cross these roads at the intersection of the two and perpendicular to each to increase safety of the crossing.
- **North Street:** North Street (Photo 14) is a local roadway with a reasonably high volume as it connects the town center to the northern side of town. There is an asphalt sidewalk along the east side of the street and the North Street Elementary school is located approximately 700 feet north of this crossing. A proposed mid-block crosswalk would give users the opportunity to access the existing sidewalk or continue on the trail. The crosswalk across North Street would have similar warning signs and pavement markings on each roadway approach to those discussed for the at-grade trail / roadway crossing. If desired, a Rectangular Rapid Flashing Beacon (RRFB) could be installed at this location. A RRFB is a user-actuated warning system that supplements warning signs at unsignalized intersections or mid-block crosswalks. RRFBs use an irregular flash pattern that is similar to emergency flashers on police vehicles. The lights are typically post mounted on both sides of the roadway and face both directions for added visibility. The warning lights can be triggered actively using push buttons or passively using sensors located on the signal post or bollards. For this project, a push button actuation is recommended. The push button actuation will be easier for the Town to maintain, while also forcing bicyclists to stop to actuate the light before crossing the roadway. The cost for a push-button RRFB is approximately $20,000 installed which includes one flashing pedestal on either side of the road. A less expensive option would be to just install signs and pavement markings without a flashing warning system (Photo 15). With the former rail corridor on the eastern side of North Street being privately owned (Photo 16), the mid-block crosswalk would be skewed at an angle across North Street to direct pedestrians to the existing sidewalk and trail users to continue along Quail Run (Photo 17).

As discussed in Chapter 1.2.3 of this Study, signs and pavement markings should be installed along the trail and roadway at and in advance of each crossing to improve safety for trail users and motorists. The location and angle of the crosswalks at these five crossings will depend on the trail layout selected.

Photo 10 Tewksbury Cemetery

Photo 11 Capitol Avenue Crossing

Photo 12 Old Boston Road Crossing

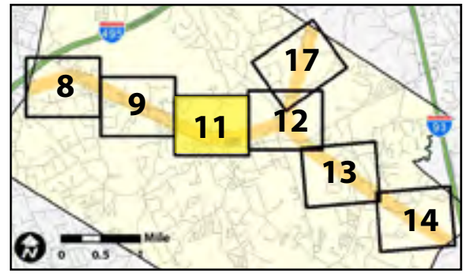
Photo 13 Power Company Road Crossing

Photo 14 North Street Crossing

Photo 15 Rectangular Rapid Flashing Beacon Installation

Photo 16 North Street, privately-owned portion of the former rail corridor

Photo 17 Quail Run at Patten Green



Map Figure Number Key

Legend

- Former Rail Corridor
- Parcel Boundaries
- Active Rail Line
- Corridor Culverts
- Protected and Recreational Open Space
- Rivers & Streams
- Wetland
- Hydrologic Connection
- Proposed Shared-Use Trail
- Proposed On-Road Facility
- (S) Signalized Crossing

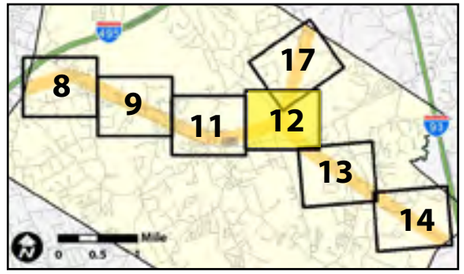
0 400 800 Feet

N

Figure 11 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography



Map Figure Number Key

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- Protected and Recreational Open Space
- Corridor Culverts
- Corridor Bridges
- Rivers & Streams
- Existing Foot Trail
- Wetland
- Hydrologic Connection
- Future On-Road Facility
- Proposed Shared-Use Trail
- Existing Trail Improvements
- Trailhead/Parking Area
- At-Grade Crossing

Feet
0 400 800

Figure 12 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

Signage Program: Though Segment 1 extends a distance of approximately 0.5 miles or less between roadway crossings, Tewksbury's emergency services personnel have requested additional signage along the corridor. In addition to directional signage, it is recommended that a signage program be developed to assist users in identifying their current location along the trail for user safety and emergency response actions. This program should include:

- Post mile markers located consistently and correctly along one side of the trail (Photo 18)
- One half-mile markers located along the trail surface between the mile markers
- Street name signs at crossings

Signs and pavement markings should be installed along the trail and roadway at and in advance of each crossing to improve safety for trail users and motorists.

Mile markers and street signs at crossings will aid in wayfinding and user safety.

Photo 18 Granite Post Mile Marker

1.3.2 Segment 2 – Wilmington Town Line to Tewksbury Senior Center

Segment 2 extends from the Wilmington Town line west to the Tewksbury Senior Center, a total distance of approximately 2.8-miles. Unlike Segment 1, sections of Segment 2 currently exist as informal walking trails. Also, based on public feedback and a review of both ownership and natural resources located along this corridor, it may be cost prohibitive for the Town to upgrade Segment 2 to a shared-use trail. As a more feasible near term alternative, it may be beneficial for the Town to evaluate developing sections of Segment 2 into a Greenway Trail and formalizing the existing paths with signage, pavement markings and soft surface upgrades in dilapidated areas along the corridor.

Wilmington line to South Street: This section of the former rail corridor is approximately 3,300-feet in length and entirely privately owned property (Figure 14). Based on discussions with the Town and the current use of the property it is unlikely to propose a connection through this section. In addition, there isn't a feasible regional connection to Wilmington at this point in time.

South Street Evacuation Route: This section of the former rail corridor is approximately 3,000-feet in length, extending from South Street to Shawsheen Street (Figure 13 and Figure 14). From South Street for about 1,500-feet, the former rail corridor directly abuts and is privately owned by the residents of Regina S Drive. The remaining 1,500-foot length is Town owned property and used on rare occasions by the town for evacuation purposes. This portion of the corridor connects Shawsheen Street to Regina S Drive and is used to provide access to these South Tewksbury neighborhoods when South Street flooding prohibits entry (Photo 19). This section of corridor is cleared, consists of a compacted gravel surface (Photo 20) and a bridge over the Shawsheen River (Photo 21 and Photo 22).

Regina S Drive was one of various roads in Tewksbury that were evaluated to determine their suitability to accommodate pedestrians and bicyclists. This evaluation included a field visit and review of available information including traffic volumes, pedestrian and bicyclist accident history, speeds, roadway width, and the presence of shoulders and sidewalks. The majority of local roadways in town do not have sidewalks. Regina S Drive (Photo 23) is a low volume, 30-foot wide local roadway that could be used to provide on-road accommodations to offer the connection between South Street and Shawsheen Street.

Based on a review of the existing roadway pavement widths within the Study Area, there is not enough available width to provide a dedicated 5-foot wide bike lane. Therefore, the recommended on-road facility type is a bike route.

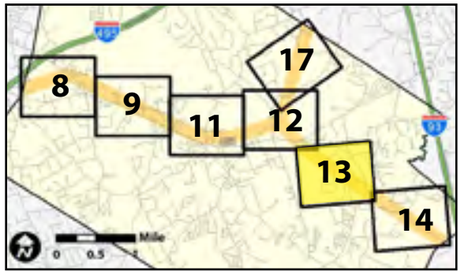
Photo 19 Regina S Drive, evacuation route entrance

Photo 20 South Street evacuation route

Photo 21 South Street evacuation route bridge over Shawsheen River

Photo 22 Shawsheen River bridge abutment

Photo 23 Regina S Drive



Map Figure Number Key

Legend

- Former Rail Corridor
- Parcel Boundaries
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- Corridor Culverts
- Corridor Bridges
- Rivers & Streams
- Existing Trail

DEP Wetlands (1:12,000)

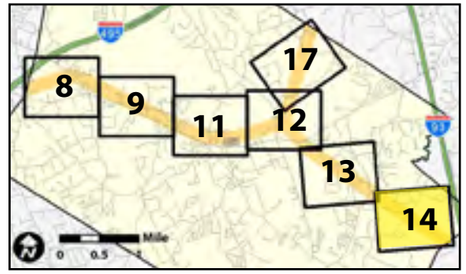
- Open Water
- Wetland
- Hydrologic Connection
- Existing Trail Improvements
- Potential Boardwalk
- Future On-Road Facility
- At-Grade Crossing

0 400 800 Feet

Figure 13 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography



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DEP Wetlands (1:12,000)

- Open Water
- Wetland
- Hydrologic Connection
- Existing Trail Improvements
- Proposed On-Road Facility
- Future On-Road Facility

0 400 800 Feet

N

Figure 14 Corridor Enlargement

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

Photo 24 Shawsheen Street Crossing at Lowe Street, looking north

Photo 25 Shawsheen Street Crossing, looking south

Photo 26 Mitchell G Drive Crossing

Photo 27 Mitchell G Drive, former railroad corridor at west side of roadway

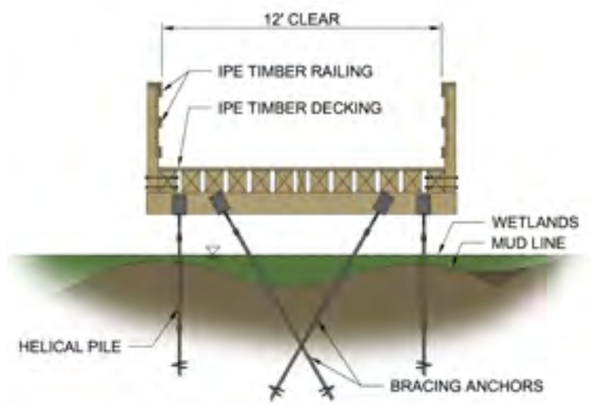


Figure 15 Section C-C: Typical Trail Boardwalk Section

Indian Ridge Condominiums: This section of the former rail corridor is approximately 2,800-feet in length, extending from Shawsheen Street to Mitchell G Drive (Figure 13). The corridor lies between the residences along Starr Avenue and Indian Ridge Condominium development. At the December 11th, 2014 Open House, residents of this area stated that there is often standing water throughout this section of the corridor. In addition, based on an initial GIS data screening of environmental resources, much of the corridor through this section appears to be designated as wetland systems.

Two alternatives through this section would allow the trail alignment to remain along the former rail corridor. One alternative would be to fill a portion of the wetland system, building the trail up on an embankment to avoid flooding and provide compensation as required. A second alternative would be to construct a boardwalk on helical screw pile foundations through the wetland system as shown in representative cross section C-C (Figure 15). Boardwalk construction can be an expensive alternative, however, utilizing this type of foundation would allow for minimal impacts to the wetland system. In addition, construction of a shared-use or greenway trail through an environmental resource area typically results in meeting regulatory requirements through trail construction. Based on the initial environmental screening of this corridor, an overview of potential permit requirements is further explained in Chapter 4.4.

As both of these corridor alternatives may prove to be cost prohibitive for the Town, on-road options were evaluated as a means to still provide a connection to these neighborhoods for trail use. These on-road options are highlighted in Figure 13:

- Beginning at Shawsheen Street and traveling northwest along Lowe Street, Starr Avenue, Martha Avenue and Maple Street.
- Beginning at Mitchell G Drive and travelling northwest along Martha Avenue and Maple Street.

Tewksbury State Hospital: North of Mitchell G Drive, Tewksbury State Hospital owns a large amount of property throughout this section of Town including parcels along Livingston Street, East Street and Chandler Street (Figure 12 and Figure 13). The former rail corridor is considered Town property extending from Mitchell G Drive to the Strong Water Brook at East Street, an approximate length of 3,000-feet. Crossing over East Street, near the intersection with Maple Street, the former rail corridor runs almost parallel to Strong Water Brook for 2,000-feet to Livingston Street at the intersection of Chandler Road. The Town engaged in a preliminary discussion with the State Hospital who has expressed support for contributing to healthy living options for local residents. However, as mentioned previously in the discussion of Segment 1, routing the trail or formalizing existing trails on State Property would require future coordination on both a local and state level. Gaining approval to utilize this land would need to be applied for through DCAMM, whom is responsible for managing State Property.

As a low cost, near term option for the Town, on-road options were evaluated in order to provide a connection between the potential parking areas to the Senior Center, East Street Fields and recreation areas. These on-road options are highlighted in Figure 12:

- Beginning at the Maple Street Trailhead and traveling west along Maple Street and East Street.
- Beginning at the Tewksbury Junction Parking area, crossing Livingston Street and traveling southwest along Chandler Street.

Tewksbury Rod & Gun Club: Northwest of the Maple Street and East Street intersection, the Tewksbury Rod & Gun Club resides on Chandler Street directly abutting and utilizing the former rail corridor (Figure 12). For safety reasons, using this section of former rail corridor to connect to the Tewksbury Senior Center is not recommended. In addition, just east of this property is what was formerly known as the Tewksbury Junction. This parcel was recently purchased and at the time of this Study, the potential land development has not entirely been determined. However a portion of this parcel is planned to be a small parking area for public use. As mentioned above, an alternative to offering a connection to the Senior Center may be to provide on-road accommodations along East Street, Livingston Street and Chandler Street. These roads would likely need to be upgraded to meet accessibility standards and provide suitable accommodations for all users.

At-Grade Roadway Crossings: Within Segment 2, the corridor crosses five local roadways at-grade.

- **South Street:** As a dead end road, South Street is a low-volume, local roadway providing access to residents in these neighborhoods. As the section from the Wilmington town line to South Street is not feasible at this point in time, a crossing at this location may not be necessary until further development of a future connection is made. As mentioned above, accommodations could be provided along South Street to provide residents with an on-road facility to Regina S Drive, further connecting to the proposed trail.
- **Shawsheen Street:** Shawsheen Street is a Rural Major Collector and heavily traveled in town, as it runs the width of Tewksbury between the Andover town line and Billerica town line. The Police Department confirmed that speeding is a problem along this stretch of roadway. Located on a straight section of road, there does not appear to be a sight distance issue at this crossing location. Similar to the North Street crossing in Segment 1, it is recommended that an RRFB be installed at this location to help warn vehicles of the trail crossing. (Photo 24 and Photo 25)

- **Mitchell G Drive:** Mitchell G Drive is a low-volume, local roadway servicing the residents and visitors of that neighborhood. Speeding and sight distance did not appear to be a problem during field visits (Photo 26 and Photo 27).
- **East Street:** East Street is a Rural Major Collector and a heavily used road in town. The Police Department confirmed that speeding is a problem and there is poor horizontal site distance to the east. The corridor crosses East Street at Strong Water Brook and the crossing is located just to the west of the intersection with Maple Street. As this intersection is known for the speeding and poor sight distance (Photo 29), the Town is pursuing the realignment of this intersection as a safety measure. The actual location of a potential trail crossing, signage and traffic signal treatment at this location would be dependent on the design and layout of the new intersection.

  The area north of Maple Street and south of East Street presents an opportunity to develop a trailhead and parking location for users looking to access this segment of the greenway trail. Another option in close vicinity to this trailhead would be the opportunity to develop a trailhead overlook area of Strong Water Brook with user amenities such as benches, kiosks, and bike racks. (Photo 30)
- **Livingston Street:** Livingston Street is a Rural Minor Collector and a moderately used road in town. The Police Department confirmed that speeding is a problem along this stretch of roadway. There is poor horizontal sight distance on the west side of the intersection that could be improved with roadside vegetative clearing. It is recommended that an RRFB be installed at this location to reduce speeds and warn vehicles of the trail crossing (Photo 31).

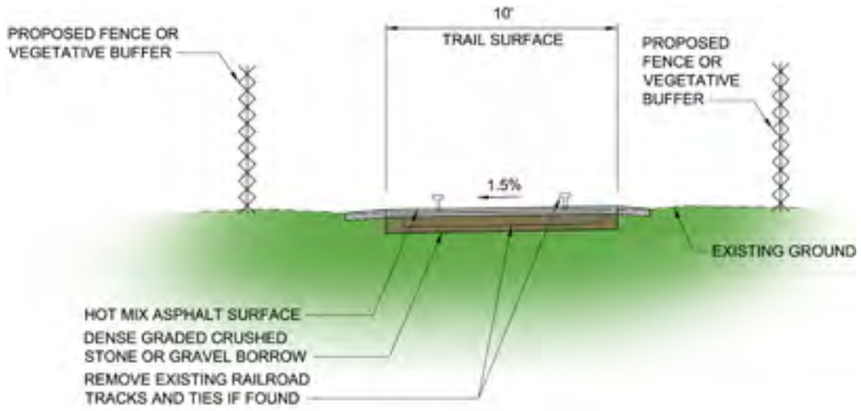


Figure 16 Section D-D: Typical Trail with Abutter Screening

Abutter Screening: At the December 11, 2014 Open House, residential abutters along this corridor section expressed concern over unwanted access and views from the trail to their property. One of the primary design goals is to maintain the natural vegetative buffer between the trail and abutting properties, where feasible. Additional measures such as fencing and vegetative screening can be installed to further retain the privacy of abutting properties, as shown in representative cross section D-D (Figure 16).

- **Fencing:** Fencing can provide a physical barrier between the trail and adjacent property. Typical options include a 6-foot high chain link fence or a wood stockade fence. The cost is approximately $25 to $35 per linear foot installed.
- **Vegetative Screening:** In areas where there is limited vegetation, evergreen trees can be planted to further retain the privacy of adjacent uses. Two evergreen tree species that are often used for screening include a White Pine and Norway Spruce (Photo 28). These species are fast growing species that require little to no maintenance. Both species are bushy and dense when young and they get more "natural" formed as they mature. For "instant" screening with no gaps, the trees would be planted in tightly spaced intervals (10 to 15-foot spacing). The better long term option would be plant them farther apart to allow for growth over time (20-foot spacing). The cost per 8 to 10 foot tall tree is approximately $500 installed. Shrubs could be used as an alternative to evergreen trees depending upon the existing topography. However, these shrubs are typically 3-4 feet tall and therefore they will only provide screening where the trail is already in a cut section (trail lower and residences higher).

Trail design should maintain the natural vegetative buffer between the trail and abutting properties, where feasible.

Photo 28 Vegetative screening example: Norway spruce and white pine

Photo 29 East Street, looking east toward Maple Street

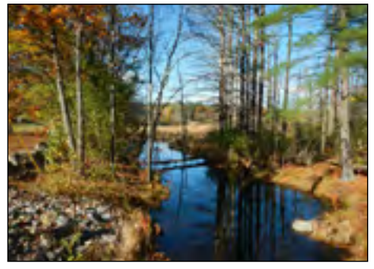
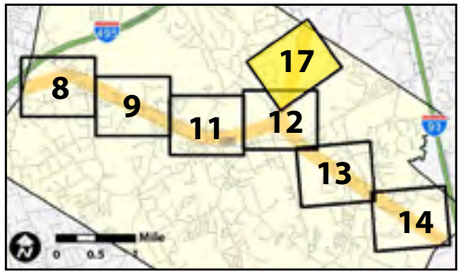


Photo 30 Strong Water Brook, view at East Street Crossing

Photo 31 Livingston Street Crossing at Chandler Road



Map Figure Number Key

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- Parcel Boundaries
- Protected and Recreational Open Space
- Corridor Culverts
- Corridor Bridges
- Rivers & Streams
- Existing Trail
- Wetland
- Hydrologic Connection
- At-Grade Crossing

0 400 800 Feet

Figure 17 Corridor Enlargement

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

1.3.3 Segment 3 – Andover town line to Tewksbury Senior Center

Segment 3 extends from the Andover town line south to the Tewksbury Senior Center, a distance of approximately 1.7-miles in total. Similar to Segment 2, it is more likely that sections of this segment could be developed as a greenway trail by formalizing existing footpaths.

Andover town line to Pinnacle Street: This section of former rail corridor is approximately 4,900-feet in length and appears entirely privately owned (Figure 17). A portion of this section is owned by residences of Bonnie Lane, William G Drive, Heather Row and Bligh Street. Another portion is owned by the Tewksbury State Hospital where informal footpaths currently exist. As it is unlikely private residences will allow the construction of the trail through their property, it is advantageous for the Town to pursue other alternatives to traverse these properties and develop a future connection to Haggett's Pond in Andover. These options consist of potentially formalizing the existing footpaths on State Hospital property or developing an on-road alternative. Based on a field visit of the roads in North Tewksbury, the width, vertical grades and sight distance do not appear acceptable to currently propose an on-road alternative to accomplish this connection. The Town would likely need to evaluate upgrading these existing roads to meet standards for accommodating cyclist and pedestrian traffic should they choose to pursue this connection future connection to Andover.

Meadow Brook: The former rail corridor extends approximately 1,100-feet from Pinnacle Street, south to the PanAm Lowell Branch running along the east side of Meadow Brook, owned by Verizon (formerly New England Telephone). This section of corridor offers beautiful views, but lacks the potential connection to other sections of the corridor (Figure 12and Figure 17). The corridor is located in a fill section with areas of steep side slopes overlooking Meadow Brook (Photo 32). To reduce and repair the erosion in this location, it is recommended that the following be installed:

- Wood rail fence on each side of the trail to control and block unwanted access
- Erosion control fabric, mat or cellular confinement system (such as geocell) to stabilize the slope.
- Fibrous plant species to re-vegetate and hold the steep slopes.

Section E-E (Figure 18) is representative of the potential slope repairs that may be necessary to protect the embankments in this area. As this section of corridor lacks the connection to other sections of the former rail corridor, this section could be considered a greenway trail, narrowing the surface width and remaining a soft surface trail section. Representative cross section F-F (Figure 19) illustrates the layout of a typical greenway trail. In order to provide a connection to Pinnacle Street, the repair of a culvert crossing would also be necessary.

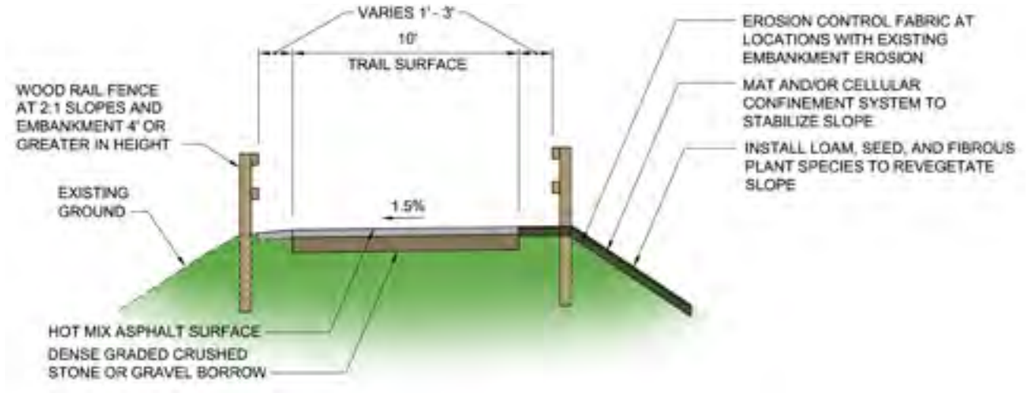


Figure 18 Section E-E: Typical Trail in Fill Section with Slope Stabilization

Photo 32 Meadow Brook section of corridor

PanAm Railroad – Lowell Branch Bridge: The spur section of the former rail corridor meets the mainline section of the former rail corridor within the Meadow Brook section. The spur and mainline intersect the active Lowell Branch line of the PanAm Railroad just north of the Tewksbury Junction. The active Lowell Branch line runs over the former rail corridors and based on a field assessment, the former bridge at this location appears to have been removed and filled in. However, the abutments from the former bridge still remain intact and in place. In order to utilize this connection, a new bridge would need to be installed to support the active rail line, which may be cost prohibitive to the Town.

Approximately 400-feet east of the former bridge location is an existing underpass which connects the informal footpaths on either side of the active rail line through the above embankment. Should the Town proceed with formalizing these trails, utilizing this underpass may be a low cost alternative to provide a connection under the active rail line without reconstructing the bridge. It is likely that allowing formal access under an active rail facility would require approval from the active railroad entity.

Tewksbury Junction: Tewksbury Junction is the triangular parcel where the northern spur corridor intersects the main corridor (Figure 12). As mentioned previously in the discussion of Segment 2, this parcel was recently purchased and at the time of this Study, the potential land development has not entirely been determined, though there is a plan in place to provide a handful of public parking spaces on a portion of this property.

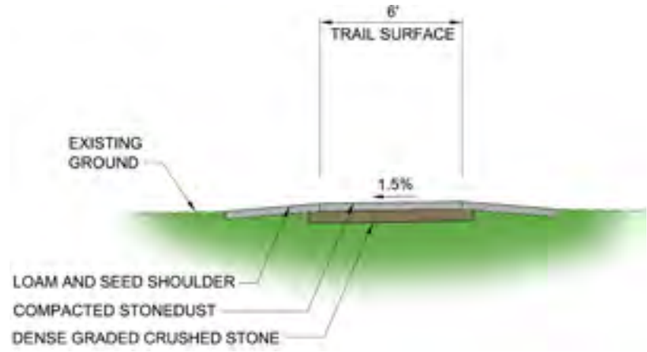


Figure 19 Section F-F: Typical Greenway Trail Section

Figure 20 Proposed Tewksbury Rail Trail Phases

Legend
Former Rail Corridor
Proposed Tewksbury Rail Trail Phasing
Phase 1
Phase 2A
Phase 2B (on-road)
Phase 2C
Phase 2D (on-road)
Phase 2E (on-road)
Phase 3
Phase 4

2.0 IMPLEMENTATION PLAN

Completing the project in its entirety would prove difficult and cost prohibitive. In addition, there are coordination efforts and subsequent agreements that need to be in place to allow certain portions of the project to be advanced. Therefore, it is recommended that the project follow a phased approach to allow time to obtain the necessary permits/approvals and secure project funding.

2.1 Phasing Strategy

The tasks under each phase have been organized based on their potential to serve users in the near term while helping to advance the larger project over the long-term. Many of these phases can be pursued concurrently depending upon available funding. The recommended phasing strategy is outlined in Table 2 and shown in Figure 20.

A phased approach to developing the trail is needed because of the complexity and cost to complete the project in its entirety.

2.2 Project Development Costs

A preliminary construction cost estimate was developed for each major project component based on the conceptual design presented in this study. In addition, project development costs also include the design costs for specific project elements, such as the Maple Street trailhead, potential boardwalk, and ongoing trail operation and maintenance costs.

2.2.1 Property Agreements

In order to pursue plans to convert the former rail corridor to a trail, the town will need to perform property research and negotiate agreements with the various public and private entities listed in Table 2. The cost to perform this reconnaissance effort and the cost to acquire the necessary property rights should be included in the project development cost estimate.

Given the cost of shared-use trail construction, most towns seek to obtain a permanent easement or deed transfer of property. These forms of property agreements run with the land and are recorded. The written agreement language needs to be accompanied by a plan prepared by a professional land surveyor. Temporary easements may also be needed for access during construction. Temporary easements are limited to a specific period of time and automatically extinguish at the end of the period. Unless a property owner donates the land to the Town, there will be a cost associated with the land transfer. The Town will need to have an appraisal performed to determine a fair value on which to base negotiations.

Table 2 Project Phasing Strategy

Phase	*Activity / Task*	*Requires PanAm or NGrid Lease*	*Other Approvals**
1	Construct 10-foot wide shared-use trail between Capitol Avenue and the Senior Center using hot mix asphalt (9,300 feet)	Yes - Portion	PanAm NGrid PPO TCC DCAMM
2A	Construct trailhead parking area and interpretive elements at East Street and Maple Street	No	DCAMM TPWD
2B	Create on-road bike route, directional signage and pavement markings from Maple Street to Shawsheen Street (6,500 feet)	No	TPWD
2C	Formalize and construct 10-foot wide greenway trail between Shawsheen Street and Regina S Drive using a compacted soft surface (1,700 feet)	No	TPWD
2D	Create on-road bike route, directional signage and pavement markings along Regina S Drive to South Street intersection (1,500 feet)	No	TPWD
2E	Create on-road bike route, directional signage and pavement markings from Maple Street trailhead along East Street to the Senior Center (3,700 feet)	No	TPWD
3	Explore shared-use trail alternatives between Maple Street and Shawsheen Street (5,300 feet)	No	DCAMM TPWD TCC PPO
4	Explore greenway trail alternatives and formalizing existing foot trails between Maple Street and Andover	No	DCAMM VER TCC PPO

* Table 2 Legend:
- PanAm – PanAm Railways
- NGrid – National Grid Utility Company
- VER – Verizon (formerly New England Telephone Utility Company)
- TCC - Tewksbury Conservation Commission
- TPWD – Tewksbury Public Works Department
- PPO – Private Property Owner(s)
- DCAMM – Division of Capital Asset Management and Maintenance

Performing a title review of a former rail corridor requires extensive research dating back to when the railroad originally acquired the ROW and then tracing the land transfers forward to the current time.

As a way to keep project development costs down, Towns often seek land donations from property owners along the corridor. Property owners have the right to forgo negotiations and donate their property or a portion of their land, to the town for development of the proposed project. The donation of land for conservation or recreational purposes may be eligible for a tax credit through the Commonwealth of Massachusetts Office of Energy & Environmental Affairs (EEA). The program involves an application process and the land must meet the selection criteria for the owner to be eligible for the credit.

Prior to acquiring any land interests, the town should hire an attorney to undertake a title review of each parcel on which a permanent easement or deed transfer is proposed. Performing a title review of a former rail corridor requires extensive research dating back to when the railroad originally acquired the ROW and then tracing the land transfers forward to the current time.

Leases or licenses generally have shorter terms and are not considered an interest in real property. These forms of property agreements may be appropriate for informal greenway trails where there is not significant level of investment required for trail construction. The associated cost to the Town will be based on the duration of the agreement (i.e. 1-year, 5 years, etc).

The terms of each property agreement will need to allow for the design, construction and maintenance of the trail.

2.2.2 Construction Cost Estimate

The unit costs associated with the major items of work are listed in Table 3. The estimated construction costs by project phase are listed in Table 4. These costs include the material and installation costs assuming the project is publicly bid and constructed by an independent contractor. The costs could be reduced if the labor was performed by volunteers or with the assistance of the Town's Public Works Department.

A 25% contingency has been applied to the costs in Table 4 to account for details yet to be determined including, for example, site amenities (benches, picnic tables, bike racks) or abutter mitigation. As discussed in Chapter 1.3.2 of this study, fencing and vegetative screening can be installed to retain the privacy of abutting properties. The cost of chain link fencing is approximately $25 to $35 per linear foot installed. The cost per 8 to 10 foot tall White Pine or Norway Spruce is approximately $500 installed.

Table 3 Unit Costs for Major Work Items

Item Description	*Unit Cost*
Compost filter tubes for erosion/sedimentation control	$10/linear foot
Clearing and grubbing	$12,000/acre
4" hot mix asphalt (HMA) over 8" Gravel Borrow	$6.50/square foot
2" compacted stone dust over 4" dense graded crushed stone (4") for trail surface	$2.50/square foot
8" dense graded crushed stone for parking areas	$2.25/square foot
4" loam borrow and seeding	$0.60/square feet
At-grade trail / roadway crossing treatments	$12,500/crossing
Wood rail fence	$50/linear foot
Wood rail fence / guardrail	$60/linear foot
Kiosk	$2,000/each
Bike route sign on steel post	$250/each
"Sharrow" pavement marking	$90/each
Rectangular Rapid Flashing Beacon (RRFB)	$20,000/crossing including both sides

For the purposes of this study, the cost estimate does not include the cost of:

- Land acquisition (permanent or temporary easements or takings)
- Utility relocations
- Hazardous materials handling, excavation or disposal

Any estimated construction costs included in funding applications should be escalated using a flat inflation rate (4%) and compounded annually to account for expected increases in the cost of construction.

2.3 Design Cost Estimate

The design cost is typically between 10% and 20% of the construction cost with the variation being attributed to the complexity of the design and extent of required permitting. The major project elements for which a topographic survey with preliminary and final design is recommended include the following:

- Former rail corridor between Capitol Avenue and the Tewksbury Senior Center
- Trailhead parking area at Maple Street and East Street
- Former rail corridor between Maple Street and Shawsheen Street

2.4 Operation and Maintenance Costs

As the TRT will be a public facility, the Town or another party will be responsible for maintenance to keep the trail in a safe, usable condition. There may be an opportunity to engage local volunteers in the maintenance and oversight of the path. The use of volunteer labor and/or resources will help reduce the costs to the Town.

Many publicly owned and managed trails incur trail maintenance costs as part of their annual public works or park and recreation operation budgets. These entities typically do not keep a separate cost and activity record of the maintenance and management of trails. Therefore, it is difficult to identify the costs related to as-needed, seasonal, and long-term maintenance activities.

The Rails-to-Trails Conservancy (RTC) Northeast Regional Office completed a study of various path/trail maintenance and operations issues for more than 100 open rail trails in the northeast region of the United States. Their findings have been compiled in a publication entitled "Rail-Trail Maintenance & Operation: Ensuring the Future of Your Trail - A Survey of 100 Rail-Trails." This publication is available on RTC's website [http://www.railtrails.org/] and applicable sections in Attachment A of this Study. The Town can consult this publication for valuable information on budgetary issues, staffing, equipment, and various other needs related to the operation and maintenance of a shared-use trail.

Table 4 Estimated Construction Costs by Project Phase

Phase	*Activity / Task*	*Estimated Construction Cost*
1	Construct 10-foot wide shared-use trail between Capitol Avenue and the Senior Center using hot mix asphalt (9,300 feet). Includes: • Compost filter tubes adjacent to wetland resource areas • 4" HMA surface over 8" gravel borrow for trail surface • Wood rail fence • At-grade trail / roadway crossing treatments (5) • Install Rectangular Rapid Flashing Beacon at North Street Crossing • Directional signage and pavement markings for on-road bike route connections *Note: Track and tie removal and disposal and site preparation are not included in the estimated construction cost listed as this may be reduced if labor is performed by volunteers or the Town. Add approximately $150K for track and tie removal and tie disposal ($15/linear foot) and $40,000 for clearing and grubbing if a different procurement method and/or contractor is selected.*	$1,100,000
2A	Construct trailhead parking area and interpretive elements at East Street and Maple Street. Includes: • Clearing and grubbing • Excavation • 8" dense graded crushed stone parking area • 2" compacted stonedust surface over 4" dense graded crushed stone base course walkway areas • 4" Loam borrow and seeding • Wood rail fence / guardrail to separate trail from parking areas • Landscaping • Interpretive elements • Kiosks	$50,000
2B	Create on-road bike route, directional signage and pavement markings from Maple Street to Shawsheen Street (6,500 feet). Includes: • Bike route signs • "Sharrow" pavement markings *Note: Add $20K to install Rectangular Rapid Flashing Beacon at Maple Street crossing*	$16,000
2C	Formalize and construct 10-foot wide greenway trail between Shawsheen Street and Regina S Drive using a compacted soft surface (1,700 feet). Includes: • Compost filter tubes adjacent to wetland resource areas • 2" compacted stonedust surface over 4" dense graded crushed stone base course for trail surface • Wood rail fence • At-grade trail / roadway crossing treatments (1) • Install Rectangular Rapid Flashing Beacon at Shawsheen Street Crossing • Directional signage and pavement markings for on-road bike route connections	$125,000
2D	Create on-road bike route, directional signage and pavement markings along Regina S Drive to South Street intersection (1,500 feet). Includes: • Bike route signs • "Sharrow" pavement markings *Note: Add $20K to install Rectangular Rapid Flashing Beacon at South Street crossing*	$5,000
2E	Create on-road bike route, directional signage and pavement markings from Maple Street trailhead along East Street to the Senior Center (3,700 feet). Includes: • Bike route signs • "Sharrow" pavement markings	$10,000
3	Explore shared-use trail alternatives between Maple Street and Shawsheen Street (5,300 feet). Includes boardwalk installation *Note: Typical cost of a boardwalk is $1,200/linear foot*	Requires further study
4	Explore greenway trail alternatives and formalizing existing foot trails between Maple Street and Andover.	Requires further study

Note: All costs listed in this table include a 25% contingency to account for details yet to be determined including, for example, site amenities and abutter mitigation.

3.0 PROJECT FUNDING

The project goal is to secure design and construction funding through public (federal, state, local) sources, grant programs and private donors. This approach will help offset some of the project development costs to the Town. In addition to the public funding sources available, there are a number of potential private and non-profit sources that could help advance the project from the study phase through construction. Potential funding sources include, but are not limited to, those listed in Table 5. Each of these potential funding programs is highly competitive.

The following program – Community Preservation Act – is administered by the Town and funds local preservation projects of varying scope.

Community Preservation Act (CPA)

CPA gives communities an opportunity to create a Community Preservation Fund for open space protection, historic preservation, affordable housing and outdoor recreation. CPA is adopted by a community ballot vote, resulting in locally raised funds through a surcharge of not more than 3% of the tax imposed against real property. In addition, the Department of Revenue annually provides each community with distributions from the statewide Community Preservation Trust Fund, which serves as an incentive for communities. Upon adoption of the Act, each community creates a Community Preservation Committee (CPC) whom is responsible for the recommendations of CPA projects. Dozens of communities have used CPA funds to develop recreational facilities by purchasing rights of way, funding design and construction and adding amenities to enhance the space for the community.

The Town of Tewksbury adopted the CPA in 2006 with a surcharge rate of 1.5% and each community has the flexibility to spend the funds to meet their unique needs. Each category of historic preservation, affordable housing, and open space must spend 10% of the funds annually and the remaining 70% can be spent in any category. Communities also have the ability to reserve funds to be spent in later years. Tewksbury voted during the Spring 2013 Town Meeting to dedicate CPA money to fund this Study.

The following two programs – Transportation Enhancement Program and Congestion Mitigation and Air Quality Improvement Program – are administered by MassDOT and fund infrastructure projects of varying scope. These programs are typically used for multi-use path design and construction.

If the TRT Committee and Town were to pursue state and/or federal project funding, the two most commonly used funding programs for bicycle and pedestrian projects are the Transportation Enhancement (TE) Program and Congestion Mitigation and Air Quality (CMAQ) Improvement Program. Both programs were originally funded through the Federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and continued via the Transportation Equity Act for the 21st Century (TEA-21). These programs are included in the current reauthorization of the Act, entitled The Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA). The availability of State and Federal funding will dictate whether a multi-use path project will proceed through the TE or CMAQ Program.

Under both programs, the Town or project proponent must demonstrate the project's feasibility to MassDOT. The Town should consider initiating coordination with the Northern Middlesex Council of Governments (NMCOG) about the potential future of the corridor so it may be included in other regional planning documents. Concurrently, the first step would be to complete a Project Need Form (PNF) and submit it to (in Tewksbury's case) the MassDOT District 4 Office in Arlington. This form should also be forwarded to the NMCOG for their files. This study should be attached to the PNF to provide additional information. The PNF can be prepared with or without the help of a consultant. MassDOT will review the PNF and evaluate the merits and readiness of the project. They will also provide the Town or project proponent, with advice on how to proceed, both in terms of the design process and available funding sources. Pending approval of the PNF, the next step is to prepare a Project Initiation Form (PIF).

Transportation Enhancement (TE) Program

In order for a project to be considered for the TE Program, Tewksbury needs to submit a funding application to the NMCOG who responsible for selecting which regional projects are eligible for consideration as TE Program funded projects. Selected projects are reviewed for eligibility and preparedness for implementation before a project is forwarded to MassDOT and the State Transportation Enhancement Steering Committee. Under this program, the City or project proponent (applicant) is responsible for 10% of the project cost. Municipalities typically do one of the

Table 5 Potential Funding Sources

	Funding Program	*Administering Agency*	*Funding Range*
1	Community Preservation Act (CPA)	Tewksbury CPC	Varies
2	Transportation Enhancement (TE) Program	MassDOT	Varies
3	Congestion Mitigation and Air Quality (CMAQ) Improvement Program	MassDOT	Varies
4	People for Bikes	People for Bikes	Up to $10,000
5	WalkBoston	WalkBoston	Varies
6	Safe Routes to School (SRTS) Program	MassDOT/MassRIDES	Less than $500,000
7	Fields Pond Foundation	Fields Pond Foundation	$2,000 to $10,000
8	New England Grassroots Environment Fund (NEGEF)	NEGEF	$500 to $10,000
9	Kodak American Pathways Grant Program	Kodak	$500 to $1,000
10	Recreational Trails Program (RTP)	DCR (State)	$2,000 to $50,000
11	Parkland Acquisitions and Renovations for Communities (PARC)	EOEEA (State)	$50,000 to $400,000
12	Private Sources	Varies	Varies

following to meet this requirement:

- Fund 10% of the design cost plus 10% of the construction cost; or
- Fund the entire design (which is typically between 10-20% of the construction cost depending upon project complexity)

Under the first option, the applicant is responsible for 10% of the design cost and then the State will reimburse the applicant the difference to complete the design. The applicant's 10% match for the construction is included in the final construction cost estimate as a list of "non-participating" items (which are items not funded by MassDOT under the specific contract). The applicant will be responsible for paying for the "non-participating" items in order to achieve their 10% requirement. This approach equates to the same dollar figure as saying the applicant is responsible for funding 10% of the design plus the construction cost.

Under the second option, the applicant funds the entire design which is often slightly more than the 10%. This option seems to be more widely used and demonstrates the applicant's commitment to help advance the project through the design phase. The applicant is responsible for administering the design contract through a MassDOT design and review process. The applicant does not provide any funding toward the construction phase of the project under this option. MassDOT would be responsible for project construction.

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

A shared-use path project often fits the eligibility requirements for both the TE Program and the Congestion Mitigation and Air Quality (CMAQ) Improvement Program of SAFETEA. CMAQ is a transportation air quality improvement program that provides funding for both bike and pedestrian facilities that serve to reduce automobile travel. The Town or project proponent (applicant) must complete a CMAQ Air Quality Analysis Worksheet for Bicycle and Pedestrian Projects to document a quantifiable reduction in auto emissions and/or congestion to be eligible under this program. Under this program, the project cost is funded 80% Federal and 20% State or local match. The applicant must be prepared to provide a local funding commitment comprised of a cash match in the amount of 10% under the same scenarios described under the TE Program.

The following three programs – People for Bikes, WalkBoston, and Safe Routes to School – support planning and small scale infrastructure improvement projects. These programs are typically used for installing bike route signage and pavement markings, conducting bikeability or walkability audits, performing any necessary ADA upgrades, and outreach and educational programs to encourage biking and walking in the community.

People for Bikes

People for Bikes (formerly Bikes Belong Coalition) is a nonprofit organization sponsored by partners in the bicycle industry. People for Bikes provides competitive national grants for projects that will "put more people on bicycles more often." They will not consider projects in which People for Bikes is the sole funder but will consider proposals where they are the initial funder and the project sponsor is looking to leverage the money for other funding programs. In 2011, People for Bikes also launched a Community Grant Program which will primarily fund the construction or expansion of bicycle facilities such as bike lanes, trails, and paths. The grants committee will also consider advocacy projects that promote bicycling as a safe and accessible mode of transportation. Eligible applicants for this program include nonprofit organizations or a local government entity. Grants range from $5,000 to $10,000. More information is available at: http://www.peopleforbikes.org

WalkBoston

WalkBoston is a nonprofit membership organization dedicated to improving walking conditions in cities and towns across Massachusetts. The organization's mission is to create and preserve safe walking environments that build vital communities. They promote walking for transportation, health, and recreation through education and advocacy. More information is available at: http://www.walkboston.org/

Safe Routes to School (SRTS) Program

The Massachusetts Safe Routes to School (SRTS) program helps to reduce congestion, air pollution, and traffic congestion near schools, while increasing the health, safety, and physical activity of elementary and middle school students. The program is managed by the Massachusetts Department of Transportation (MassDOT) with assistance from MassRIDES. The program is typically initiated by the school administration, parents association or Town. In order to be eligible for infrastructure projects targeted to enhancing safe access to schools, a school must partner with MassRIDES on education, encouragement, enforcement, and evaluation activities and take part in safety training for 1 full year. Grants typically fund projects less than $500,000. More information is available at: http://www.commute.com/schools

The following three programs – Fields Pond Foundation, New England Grassroots Environmental Fund, and Kodak American Pathway Grant Awards Program – are smaller grant programs which focus on enhancing partnerships and building project support in the community. These programs are typically used for newsletters, visioning workshops, and educational programs to encourage biking and walking in the community.

Fields Pond Foundation

The primary mission of the Fields Pond Foundation is to provide financial assistance to nature and land conservation organizations that are community-based and serve to increase environmental awareness by involving local residents in conservation issues. Proposals from municipal government agencies are encouraged. The foundation accepts project grants for trail-making and other enhancement of public access to conservation lands, rivers, coastlines and other natural resources. They look for opportunities where a modest investment of grant funds can help in a significant way to improve public access to, and enjoyment of natural areas while maintaining the health and integrity of the environment. Projects in which volunteerism is a significant component are more likely to be funded. The expected range of grants is $500 to $25,000, with most falling within the range of $2,000 to $10,000. The Foundation is willing to consider multiple-year grants. Proposals may be submitted at any time since the Directors meet regularly throughout the year. It is recommended that applicants contact them informally before proceeding to prepare a formal application. More information is available at: http://www.fieldspond.org/

New England Grassroots Environment Fund (NEGEF)

The New England Grassroots Environment Fund (NEGEF) supports volunteer-driven groups that are doing community-based environmental work in the New England region. They offer seed grants to support community groups launching new project and/or evolving the scale of an existing project. As examples, a prior grant was awarded to the Great Barrington Trails and Greenways Project to develop a public outreach program that included a monthly e-newsletter, a vision map, community walks, and meetings with community groups to promote broader participation. In addition, the Squannacook River Trail Committee in Townsend received a grant to mail informational flyers to share news about the committee's progress and urging townspeople to continue their support. Grants range from $500 to $10,000. More information is available at: http://www.grassrootsfund.org/

Kodak American Pathways Grant Awards Program

The Kodak American Pathways Grant Awards Program is a partnership project of the Eastman Kodak Company, the Conservation Fund, and the National Geographic Society. The program provides small grants to stimulate the planning and design of pathways in communities throughout America. Grants may be used for activities such as: mapping, ecological studies, surveying, conferences, and design activities; developing brochures, interpretative displays, audio-visual productions or public opinion surveys; hiring consultants, incorporating land trusts, building a foot bridge, planning a bike trail, or other creative projects. In general, grants can be used for all appropriate expenses required to complete a pathway project including planning, technical assistance, legal and other costs. Letters of support from associated agencies, public officials, citizen groups, or nonprofit organizations must be included with the application. Eligible applicants include local, regional, or Statewide nonprofit organizations. Although public agencies may also apply, community organizations will receive preference. The maximum grant is $2,500, however most grants range from $500 to $1,000. More information is available at: http://www.conservationfund.org/

The following two programs – Recreational Trails Program and Parkland Acquisitions and Renovations for Communities –are competitive programs administered by agencies under the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) that fund infrastructure projects of varying scope. These programs would be ideal funding sources for multi-use trail construction along the former railroad ROW.

Recreational Trails Program (RTP)

The Recreational Trails Program (RTP) provides federal funding support for a variety of trail development and maintenance projects and is administered on a reimbursement basis by the Massachusetts Department of Conservation and Recreation.

The RTP funds up to 80% of each trail project, with at least 20% of the total project cost funded by other sources. The match can consist of money from other sources such as non-Federal grants, donations, or municipal funds. A "soft match" in the form of materials, labor, and in-kind services is also permitted. "Soft match" contributions include paid labor, volunteer/donated labor, purchased materials and services, and donated labor and materials. Grant amounts, not including the match, may range from $2,000 to $50,000, with requests greater than $50,000 being considered for regional or statewide projects.

Unlike the projects programmed for inclusion on the TIP or through TE or CMAQ, the RTP requires that projects be primarily recreational in nature, rather than transportation oriented. Priority will be given to projects that create or facilitate physical improvements that seek to protect or enhance the site's natural and cultural resource values while also satisfying a recreational demand. Historically, grant applications seeking funds for trail planning and design activities have not been looked at favorably. More information is available at: http://www.mass.gov/eea/agencies/dcr/services-and-assistance/grants-and-technical-assistance/

Parkland Acquisitions and Renovations for Communities (PARC)

The Parkland Acquisitions and Renovations for Communities (PARC) Program is administered by the EEA. The PARC program provides grant assistance to cities and towns to acquire parkland, develop new parks, or renovate existing outdoor public recreation facilities (formerly the Urban Self-Help Program). Municipalities must have a current open space and recreation plan to apply. In addition, all properties for which grant assistance is provided must be open to the general public for appropriate active recreational use. Also, as the property will become protected open space under Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, the applicant must own the property in fee. Grants range from $50,000 to $400,000. More information is available at: http://www.mass.gov/eea/dcs-grants

The TRT Committee and Town could reach out to a number of potential private donors both locally and Statewide to seek project support and funding. Such donors could include local corporations, developers, or public health service providers (hospitals) as well as other nonprofit organizations such as the Trustees of Reservations or Trust for Public Land.

Private Sources

Many regional private companies and nonprofits have financial resources that that they contribute as part of a community outreach program. For example, Intel Corporation of Hudson, Massachusetts donated funds and assistance, in the form of volunteers, to the Assabet River Trail project through their "Intel in the Community" program. In Salisbury, the Timberland Company, local contractors, town workers and volunteers sponsored a cooperative Earth Day work event to help construct an extension of the Salisbury Point Ghost Trail.

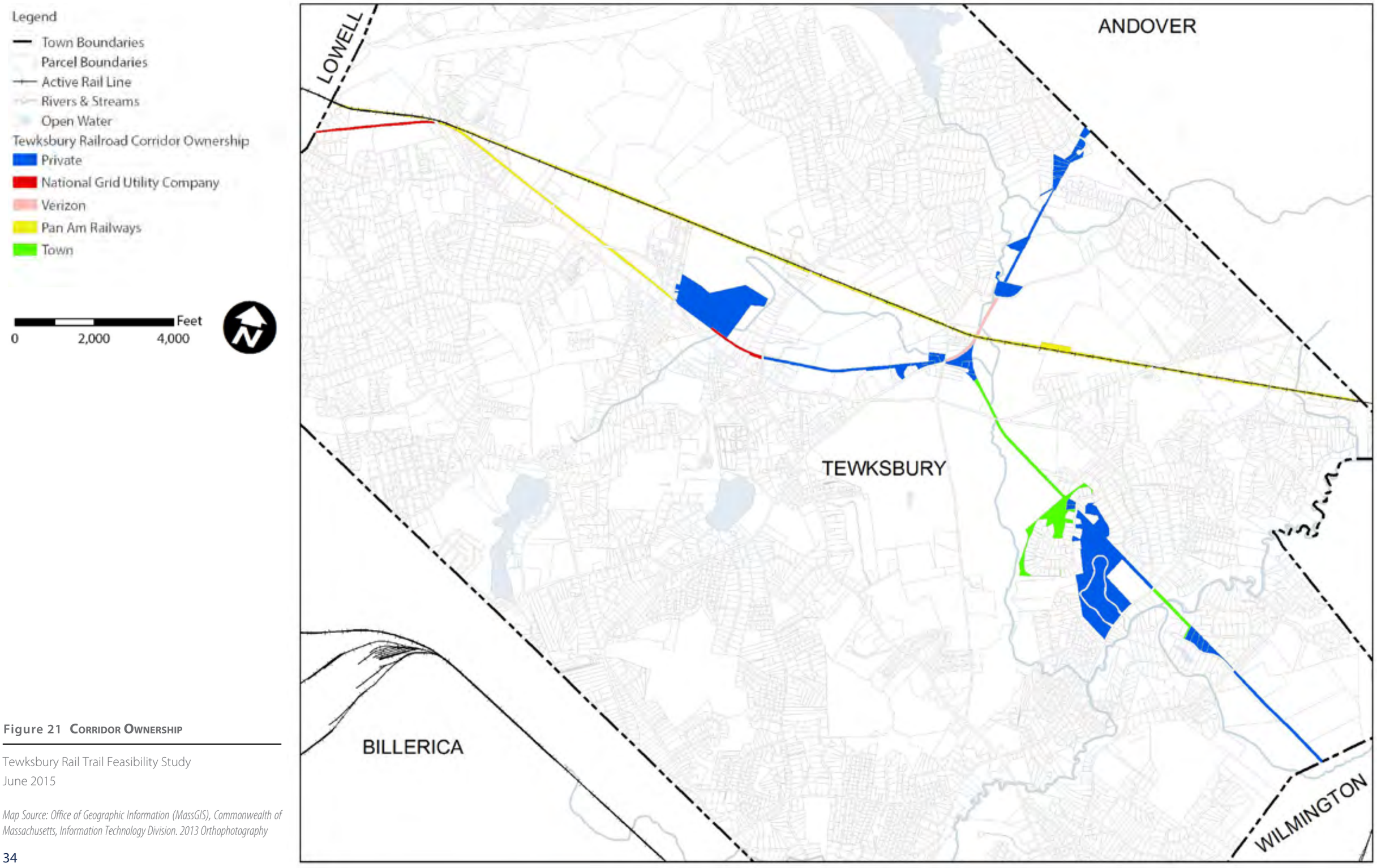


Figure 21 Corridor Ownership

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

4.0 PHYSICAL INVENTORY AND ASSESSMENT OF THE RIGHT-OF-WAY

This chapter provides an overview of the key design issues, opportunities and constraints that informed the conceptual design for the proposed shared-use path. The analysis included the railroad corridor, existing site conditions, environmental resources and permitting requirements.

4.1 Former Railroad Corridor

This section looks at the history of land ownership along the former historic Lowell & Lawrence (L&L) and Salem & Lowell (S&L) railroad alignments.

4.1.1 History of Rail Service

The Rail Lines of Southern New England: A Handbook of Railroad History by Ronald Dale Karr, provides some background to when the Lowell & Lawrence and Salem & Lowell lines were built, in operation, and abandoned. The below paragraphs and Table 6 summarize Karr's research on these lines.

Table 6 Tewksbury Railroad History

Rail Line	*Year Chartered*	*Start of Local Service*	*End of Local Service*	*Year Line Abandoned*
Lowell & Lawrence	1846	1848	1924-1979	1926-1983
Salem & Lowell	1848	1850	1924	1925

The S&L Railroad was built as a connection to the L&L Railroad. The two lines connected at Tewskbury Junction, and provided service to passengers and freight between the industrial centers of Lowell and Lawrence and downtown Salem. The S&L tracks crossed a Boston & Maine (B&M) line at Wilmington Junction, and B&M was soon able to extend its service to Lowell. This was in direct competition with the Boston & Lowell (B&L) Railroad service, and a battle ensued between these two railroads for ownership. At the time, the B&L came out victorious and bought the L&L/S&L line in 1858. This led the B&M to build its own branch into Lowell in 1874, and the competition between the two railroads ended in 1887, when B&L sold the L&L/S&L rights to the B&M.

Passenger and freight service between Wilmington Junction and Tewksbury Junction on the S&L declined after 1900 and the service was suspended in 1924. B&M abandoned this section of the line the following year, though portions of the remaining line to Peabody ran in various modes until about 1980.

From 1887 until about 1920, the B&M ran its two parallel lines between Lowell and Lawrence. After this time, trains running between Lowell and the Wamesit Station in West Tewksbury were rerouted to use the newer B&M line. However, this section was not abandoned until 1936. The line between Tewksbury Center and South Lawrence was abandoned in 1926. The section of the L&L between Wamesit and Tewksbury Centre was used for freight service until 1979 and was abandoned in 1983. (Karr, p. 239-232 & 251-252)

Pan Am Railways runs an active freight service branch through the northern portion of town (former B&L line)[1]. The railroad line and study corridor cross, south of Pinnacle Street.

4.1.2 Current ROW Ownership

Figure 21 illustrates ownership of the study corridor, as recorded in Tewksbury's 2015 Assessor's Database. The majority of the corridor has been transferred to private ownership. Three sections of the former railroad ROW are shown as utility easement, portions of Segment 2 have been obtained by the town, and a section of Segment 1 is shown as owned by Pan Am though no longer an active rail line.

4.1.3 ROW Width

Some of the most popular records among historic preservationists, railroad history experts, and even genealogists are the railroad valuation records of the Interstate Commerce Commission (ICC). These records provide documentation pertaining to the railroads of the United States from their beginning until the 1960s. Most valuation records were created between 1915 and 1920 by the ICC and railroad engineers who undertook a massive project to inventory almost every aspect of the U.S. railroad system for the purpose of determining a net worth for each railroad. This value was then used to calculate passenger and freight rates.

> Val Maps were once used to determine passenger and freight rates. Today, they provide a record of railroad facilities and property ownership along a railroad corridor, from its beginning to the 1960s.

Railroad Valuation Maps (Val Maps) provide information about the railroad facilities existing at a particular location, the land owned by the railroad and how it was acquired, and the land adjacent to railroad property during the period 1915-1920. Periodic engineering updates follow changes in facilities and rolling stock held by a railroad from the period of the basic valuation to the 1960s. Val Maps included culverts, bridges, track information, mile markers, round houses, stations, etc., anything that increased the value of the line. In general, based on a review of the Val Maps, the existing ROW for the study corridor consists of the following in Table 7:

1 Information from Pan Am and Massachusetts Railroad Association websites.

Table 7 Railroad Corridor ROW

Location	*Width (in feet)*
Segment 1	66
Segment 2	82.5
Segment 3	74.25

Potential Trail Demand and Usage

Since the trail has not yet been constructed, determining the volumes anticipated on the proposed trail needs to be determined based on similar trails that are currently in operation. The Central Transportation Planning Staff has put together a Bicycle and Pedestrian Count Database that consists of counts of non-vehicular users at a number of different shared-use trails across Massachusetts. These trails vary and consist of urban, suburban and rural trails. For the purpose of estimating the potential trail demand and usage, these counts were researched and the Bicycle and Pedestrian volumes associated with the Nashua River Trail and Bruce Freeman Trail were utilized. A table of the volumes collected on these trails is presented in Table 8.

Table 8 Bike and Pedestrian Counts

	Nashua River Trail		*Bruce Freeman Trail*	
	Weekday	*Saturday*	*Weekday*	*Saturday*
7-8 AM	6*	38	5*	49
8-9 AM	12	79	39	50
9-10 AM	19*	110	26*	81
10-11 AM		146		101
11-12 PM		136	46*	102
12-1 PM		125	70	106
1-2 PM		108	45*	139
2-3 PM		113		189
3-4 PM		134		179
4-5 PM		130	37*	190
5-6 PM	60	93	85	174
6-7 PM	48	62	5*	100
* Only half of hour was counted				

4.2 Site Conditions

This section evaluates existing site conditions along the ROW to identify potential constraints to converting the former railroad corridor into a shared-use trail.

The evaluation of site conditions was completed utilizing existing reports/studies and mapping, aerial orthophotography, state geographic information system (GIS) data, and field investigation.

4.2.1 Land Use

The study corridor makes a "Y" across the town, with Segment 1 ending at a neighborhood in Lowell, Segment 2 leaving users at the Wilmington border at an undeveloped parcel owned by Tewksbury Town Center LLC, and Segment 3 stopping at conservation land in Andover. Segments 2 and 3 of the study corridor abut forested land, open fields, wetlands, and residential properties. Segment 1, which generally parallels East and Main Streets, is a much more developed section of the corridor which includes civic, commercial, and industrial properties, in addition to residences, forest, and wetlands.

Photo 33 Typical railbed (Trail Segment 3)

Photo 34 East Street Fields

Photo 35 Tewksbury State Hospital Property Pathway

Photo 36 Tewksbury Town Common

There are many protected open space and recreational properties along the study corridor. One of these is the Tewksbury State Hospital, with local hiking trails throughout. This includes a number of parcels near the center of town, much of which is now permanently protected conservation land. Additional open space parcels, adjacent to the corridor, include:

- Privately-owned Rod & Gun Club off Chandler Street
- Open space land near the Andover town line
- Town recreation land (East Street Fields)
- Town conservation land
  - Point Lewis Land (off Bligh Street)
  - Leighton Estates Land (off Leighton Lane)
  - Conservation Land at Shawsheen Street
  - Conservation Land at Regina S Drive
  - Sutton Meadow off Shawsheen Street/Regina S Drive

Other areas in town are also well positioned to develop connections to the envisioned Tewksbury Rail Trail, including:

- Businesses along Main Street
- Shawsheen Place off Old Boston Road
- North Street Elementary School and residences
- Town Center, including Town Hall and the Senior Center
- Ryan School /High School
- Livingston Street Recreation Area

4.2.2 Topography

The profile of the main corridor is relatively flat from the Lowell city line to the Wilmington town line. However, there are some depressed sections along the corridor where wetland systems exist and the adjacent cut and fill slopes vary over the length of the corridor. There are other select locations where the corridor is relatively level across the width of the ROW.

The profile of the spur corridor north to the Andover town line also appears relatively flat, though sections of this are elevated on an embankment. The section south of Pinnacle Street is located in a fill section with wetlands along either side of the corridor. Along the main corridor and spur corridor, there are a number of informal footpaths that connect to the corridor and vary in elevation and accessibility.

4.2.3 Vegetation

The ROW has varying levels of vegetation, from thick grasses to mature woodland vegetation, which has established since the last trains operated. The existing vegetation on adjacent cut slopes provides some screening between adjacent properties and the corridor, particularly during the spring and summer months. Conversely, the section between North Street and the Cemetery is relatively devoid of vegetation due to intermittent use in previous years.

4.2.4 Railbed

Based on field reconnaissance, the tracks and rails appear intact along the majority of the corridor. There are some sections, especially along the northern spur, where it is difficult to determine the condition of these rails as they have become buried with low-lying vegetation and debris. Based on a preliminary view, these existing conditions do not appear to limit the proposed width of the trail to a dimension narrower than 10-feet along the corridor.

4.2.5 Road and Rail Crossings

There are a total of thirteen at-grade road crossings along the study area. These crossings are:

- Capitol Ave
- Old Boston Road (in two locations)
- Power Company Road
- Archstone Avenue (in two locations)
- North Street
- Livingston Street, near intersection with Chandler Street
- Maple Street
- East Street (at bridge over Strong Water Brook)
- Mitchell G Drive
- Shawsheen Street
- South Street at intersection with Regina S Drive

The former corridor also crosses the active Pan Am railroad tracks, south of Pinnacle Street. The Boston and Maine Railroad Valuation Maps indicate a section post bridge over this location, which does not appear on current orthophotography.

4.2.6 Drainage and Stream Crossings

Along the ROW, several existing culverts and bridges convey natural waterways and drainage to either side of the rail bed embankment. The Railroad Valuation Maps were used as a guide for identifying the culverts and bridges along the corridor. As part of the trail design, field reconnaissance efforts should indicate that each of these culverts is functioning properly.

Photo 37 Shawsheen River Crossing

The Railroad Valuation Maps indicate three water crossings along the project corridor (Table 9): one coincides with the East Street intersection over Strong Water Brook (Segment 2); another over the Shawsheen River (Segment 2); and a third over a wetland (Segment 3). Culverts along the corridor are listed in Table 10.

Table 9 Bridges along the Study Corridor

#	Val Map Station	Size/Material	Location Description
1	276+63.4	Section Post	Over RR - 1,100ft So. of Pinnacle St.
2	286+59	Iron Stringers	Over wetland - 130ft So. of Pinnacle St.
3	804+42	Pile Trestle	Over Shawsheen River - 500ft So. of Shawsheen St.
4	867+31.4	N/A	Over Strong Water Brook - 50ft So. of East St.

Working in conjunction with the culverts, existing swales along the ROW capture runoff from the rail bed and adjacent upland areas. Many of these swales have not been maintained over time and have become clogged with vegetative debris. Once cleaned, the swales will restore existing drainage patterns along the ROW. This effort should be coordinated with the Tewksbury Conservation Commission to determine if any of these swales are jurisdictional wetland resource areas.

Table 10 Culverts along the Study Corridor

#	Val Map Station	Size/Material	Location Description
1	56+05	2.0′ x 2.0′ Stone Box	800ft East of Lowell Town Line
2	103+54.1	2.0′ x 2.0′ Stone Box	1,500ft West of Main Street (Rte. 38)
3	113+41.8	2.0′ x 2.0′ Stone Box	500ft West of Main Street (Rte. 38)
4	115+66.7	2′ Vit. Pipe	250ft West of Main Street (Rte. 38)
5	120+80.1	12″ Vit. Pipe	250ft East of Main Street (Rte. 38)
6	132+08.5	2.0′ x 2.0′ Stone Box	850ft West of Colab Road
7	139+96	3.0′ x 1.0′ Stone Box	50ft West of Colab Road
8	147+80	2.0′ x 2.0′ Stone Box	650ft West of Capitol Avenue
9	155+55	2.0′ x 2.0′ Stone Box	100ft East of Capitol Avenue
10	159+52	2.0′ x 2.0′ Stone Box	450ft East of Capitol Avenue
11	172+25±	2′ Iron Pipe	90ft East of Old Boston Road
12	191+78.3	Iron Pipe	150ft West of Old Boston Road
13	208+23.8	2′ Vit. Pipe	1,150ft West of North Street
14	213+00±	2″ C.I. Drain	780ft West of North Street
15	229+01	2.0′ x 3.0′ Stone Box	900ft East of North Street
16	254+25	2.0′ x 1.0′ & 3.0′ x 4.0′ Double Stone Box	1,200ft West of Livingston Street
17	266+85	4.0′ x 7.0′ Rail Covered Box	40ft East of Livingston Street
18	279+37	Stone Box	850ft South of Pinnacle Street
19	292+88	2.0′ x 1.0′ Stone Box	475ft North of Pinnacle Street
20	312+83.8	Rail Top	2,500ft North of Pinnacle Street
21	312+98.7	3.0′ x 4.0′ Stone Box	2,500ft North of Pinnacle Street
22	324+51.5	2.0′ x 1.0′ Stone Box	570ft South of Bonnie Lane
23	331+86.2	3.0′ x 3.0′ Stone Box	110ft South of Andover Town Line
24	233+06.4	5.0′ x 4.0′ Rail Top	At Andover Town Line
25	767+09.8	1.0 ‘x 2.0′ Stone Box	1,900ft North of Wilmington Town Line
26	780+14	12″ C.I.	10ft South of South Street
27	784+81	22″ Vit. Pipe	450ft North of South Street
28	798+16	3.0′ x 5.0′ Stone Box	1,150ft South of Shawsheen Street
29	814+26	18″ C.I. Pipe	500ft North of Shawsheen Street
30	818+44	2′ C.I. Pipe	1,000ft North of Shawsheen Street
31	846+34.5	2.0′ x 2.0′ Stone Box	1,000ft North of Mitchell G. Drive
32	858+13.7	2.0′ x 2.0′ Stone Box	2,000ft North of Mitchell G. Drive
33	867+31.4	4.0′ x 4.0′ Stone Box	At East Street
34	867+31.4	5.0′ x 7.0′ Stone Box	At East Street
35	874+90	N/A	750ft North of East Street
36	880+00±	4.0′ x 3.0′ Double Stone Box	1,700ft North of East Street

4.2.7 Utility Infrastructure

Where the former railroad corridor intersects Old Boston Road and Power Company Road, high-tension overhead wires span over and adjacent to the corridor within the Pan Am ROW, supported on large steel poles. Also, as previously discussed in 1.3.1, there are two lines of parallel utility poles between the Halstead Tewksbury property and North Street, owned by National Grid.

4.2.8 Landfills and Hazardous Waste Sites

The railroad lines in Tewksbury originally served a heavy industrial area. Much of the corridor is within undeveloped and residential areas of Tewksbury. However, numerous industrial and commercial parcels abut Segment 1 toward Lowell. Typical contamination within a railroad right-of-way includes polycyclic aromatic hydrocarbons (PAHs) and metals. Industrial areas and certain railroad operations such as the railroad junction with switches located east of the Chandler street-Livingston Street intersection represent areas where further evaluation is recommended. Active regulated sites, as shown in the MassGIS database, are identified on Figure 22 and Figure 23.

As mentioned in Chapter 2.2.2, the estimate does not include any costs associated with potential excavation and disposal of contaminated soil. While no reviewed information directly indicates the presence of contamination, further evaluation is recommended to determine the procedures to include in the design plans and specifications. The recommended investigations will follow DEP guidance for development of a rail trail. This includes further review of data on identified sites, a site walk of the entire corridor, and, potentially, a soil sampling program. Any encountered contaminated soils associated with the project area will require appropriate handling by implementation of a Health and Safety Plan; Monitoring, Handling, and Stockpiling of Contaminated Soils; and Disposal of Contaminated Soils under the construction contract. It is anticipated that the project design will seek to balance cut and fill volumes to minimize the need to transport materials off-site. Any excess soil that leaves the site first must be sampled for typical landfill reuse contaminants.

Legend

- Former Rail Corridor
- Town Boundaries
- Active Rail Line
- AUL Sites

MassDEP Active Chapter 21E Sites

- TIER I
- TIER II

Land Cover Data (2005)

- Industrial
- Commercial
- Residential
- Urban Public/Institutional
- Recreation
- Powerline/Utility
- Other

MassDEP 2012 Integrated List of Waters - 305(b)/303(

Rivers

- 2 - Attaining some uses; other uses not asse
- 4A -Impaired - TMDL is completed
- 5 - Impaired - TMDL required

Lakes

- 5 - Impaired - TMDL required

Feet
0 1,000 2,000

Figure 22 Land Use and Hazardous Materials (West)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

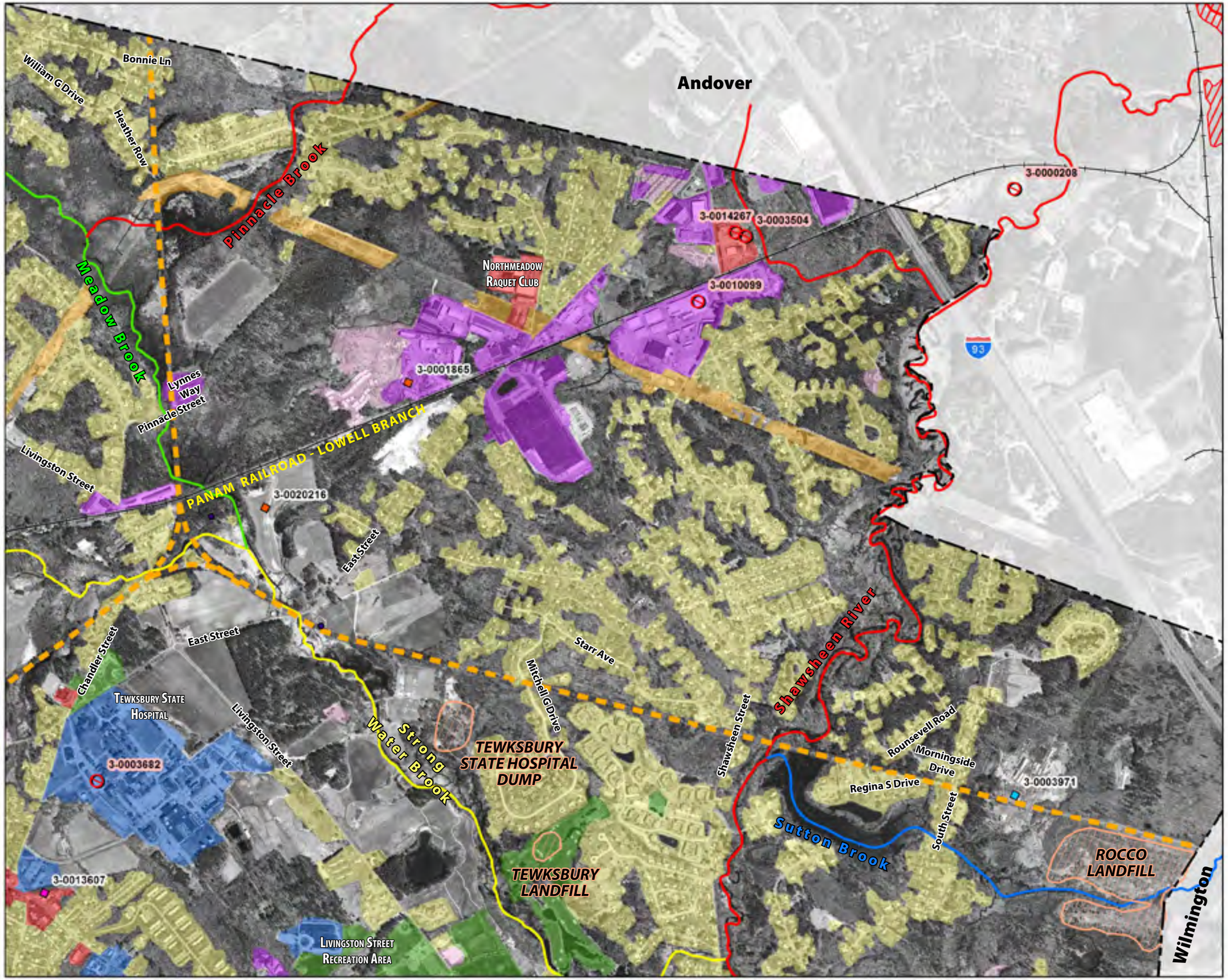


Figure 23 Land Use and Hazardous Materials (East)

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

4.3 Environmental Resources

Identifying the cultural and environmental resources proximate to the study corridor is an important step of the project development process that helps inform corridor planning and trail design. Knowing the location of particular resources will also facilitate the permitting process required by regulatory agencies for project construction (See Chapter 4.4 "Regulatory Requirements").

Corridor planning may include establishing connections to existing recreation land, civic places or historic sites.

Trail design could involve scenic overlooks at places of interest, or retaining walls and bridges to avoid wetland impacts.

4.3.1 Surface Water and Wetlands

There are four waterways that intersect with the study corridor: Shawsheen River, Strong Water Brook, Meadow Brook, and Pinnacle Brook. These rivers and streams are part of the Shawsheen River Watershed, and they flow south, toward Billerica. The wetlands west of Nelson Avenue and the power line through Great Swamp flow north toward the Merrimac River. Strong Water Brook (MA83-07), Pinnacle Brook (MA83-15), and Shawsheen River (MA83-18) have been identified as "impaired waters" by the Massachusetts Department of Environmental Protection (MassDEP). This means the current level of pollution in these waters make them unsafe for uses such as fishing or swimming. Figures Figure 24 and Figure 25 illustrate hydrological systems and regulated resources within the study area.

The locations where the trail meets water and wetland resources may provide scenic view points and educational opportunities. In addition to being valuable places of interest for trail users, special attention must be taken to protect these resources during trail construction and operation (see Chapter 4.4.1). The rivers and streams, along with their associated wetlands, are valuable ecosystems for fish and wildlife habitat, flood protection and water quality.

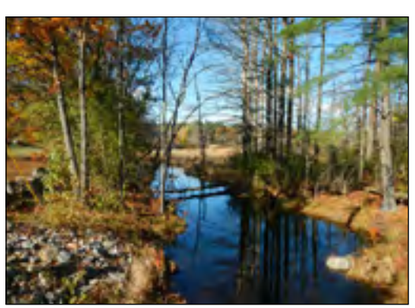


Photo 38 Strong Water Brook

4.3.2 Floodplain

Tewksbury is subject to periodic flooding, particularly in the Shawsheen River Watershed during 100-year storm events (OSR, p.53). The Federal Emergency Management Agency (FEMA) identifies, assesses, and maps flood hazard and risk areas to guide development planning and insurance processes. Figure 24 and Figure 25 illustrate where FEMA flood zones overlap with the study corridor. The areas shown with red hatching indicate a floodway. Special design considerations would be required for trail improvements in these zones (see Chapter 4.4.1).

A **floodway** is the estimated channel width that a watercourse requires to convey water during a flood

4.3.3 Groundwater

The MassDEP protects aquifers important to public groundwater supply sources. There are two active community wells located on Tewksbury State Hospital land, which are protected by Massachusetts Drinking Water Regulations (310 CMR 22.02). Figure 24 and Figure 25 show that a large portion of the study corridor is covered by a MassDEP Approved Wellhead Protection Area (Zone II). Trail construction is a permitted use in this protection area (Tewksbury Zoning Bylaw Section 8321.c.), and it could provide a good opportunity to educate the public about ways to protect the water supply.

4.3.4 Important Habitat Areas

A trail that encounters a variety of landscape types can provide good opportunities for wildlife viewing. This can create a unique experience for trail users, though special precautions must be taken during the design phase to protect wildlife during trail construction and from future bicycle and pedestrian traffic.

Habitat areas mapped by the Massachusetts Division of Fish and Wildlife (DFW) Natural Heritage & Endangered Species Program (NHESP) for the protection of plants and animals listed as Endangered, Threatened or of Special Concern throughout the Commonwealth are shown on Figure 24 and Figure 25. The mapping identifies three habitat areas – two overlapping areas in the northern area of town, and one west of the Shawsheen River near the Wilmington Border.

Priority Habitat indicates areas of state-listed rare species

Estimated Habitat indicates areas of state-listed wildlife species located in wetlands

Both are protected under the Massachusetts Endangered Species Act (MESA; M.G.L. c.131A).

A request for information was sent to NHESP in order to determine which state-listed rare species have been found within these areas. A determination was sent on November 25, 2014, identifying the following protected species, which have been found within the vicinity of the project corridor:

Priority Habitat 1459

Scientific name	Common Name	Taxonomic Group	State Status
Callophrys irus	Frosted Elfin	Butterflies and Moths	Special Concern
Apodrepanulatrix liberaria	New Jersey Tea Inchworm	Butterflies and Moths	Endangered
Euchlaena madusaria	Sandplain Euchlaena	Butterflies and Moths	Special Concern

Priority Habitat 523 & Estimated Habitat 435

Scientific name	Common Name	Taxonomic Group	State Status
Ambystoma laterale	Blue-Spotted Salamander	Amphibian	Special Concern

Potential and Certified Vernal Pools are also shown on the figures noted above. They are mapped within both of the habitat locations mentioned above, and a potential vernal pool is mapped in the wetland area behind the Wal-Mart Superstore on Main Street. These special waterbodies are extremely important to a variety of wildlife and are protected by state and federal regulations (see Chapters 4.4.1 and 4.4.2).

4.3.5 Cultural Resources

Historical buildings and landscapes can be valuable community features along a rail trail which help to tell the story of the town and create destination points for trail users.

The Tewksbury State Hospital National Register Historic District is at the center of town. It is one of three Almshouses established by state legislation in 1852. Segment 2 of the study corridor includes the district boundaries (see Figure 27), but not any contributing structures or landscapes. Trail construction should not have an adverse impact to the Historic District, but coordination may be required with the Massachusetts Historical Commission (MHC, see Chapter 4.4.3).

Almshouses were built to provide charitable housing to the poor.

Three residential areas, including the civic center of town, and a few isolated homes were inventoried by the Tewksbury Historical Commission in 1974. These "Town Centre" sites have not been established as a formal district for preservation by local, state, or federal authorities, but are mapped historical sites, recorded with MHC, which are in the vicinity of the study corridor (see Figure 26).

In *A Field Guide to Southern New England Railroad Depots and Freight Houses*, John H. Roy Jr. describes the Tewksbury Center Depot. The building was moved from its original location and converted to a residence. It sits about 150 feet south of where the study corridor crosses North Street.

Photo 39 Old railroad structure (Trail Segment 3)

Legend

- Former Rail Corridor
- Town Boundaries
- Active Rail Line
- Impervious Area
- Structure
- MassDEP Zone II Wellhead Protection Areas
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools (CVP)
- NHESP Potential Vernal Pools: NOT equivalent to CVP

MassDEP Wetlands (1:12,000)

- Open Water
- Marsh
- Wooded Swamp
- Hydrologic Connection

MassDEP Hydrology (1:25,000)

- Intermittent Stream
- Perennial Stream

FEMA Flood Zones

- Regulatory Floodway
- 1% Annual Chance of Flooding
- 0.2% Annual Chance of Flooding

0 1,000 2,000 Feet

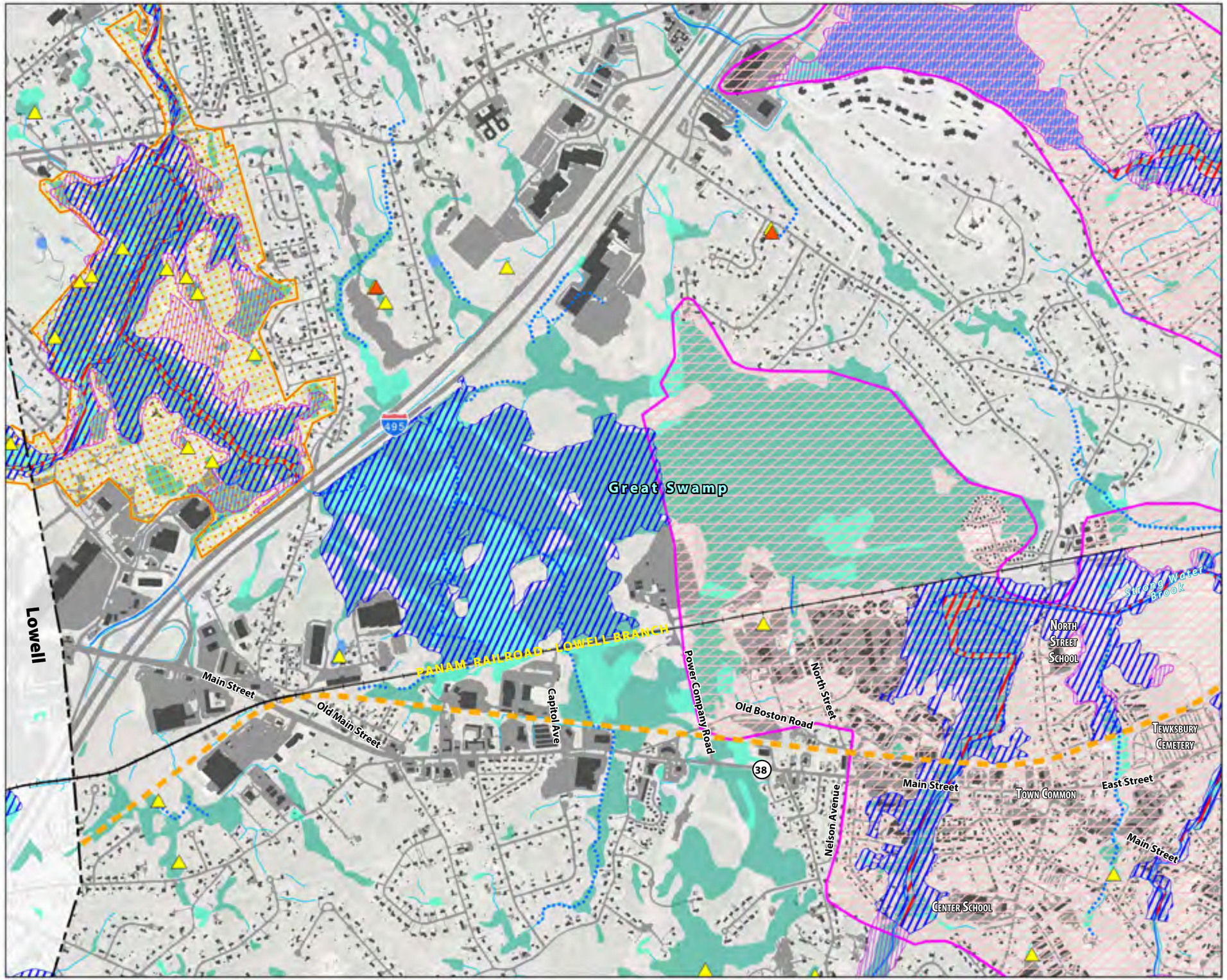


Figure 24 Hydrological and Habitat Resources (West)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

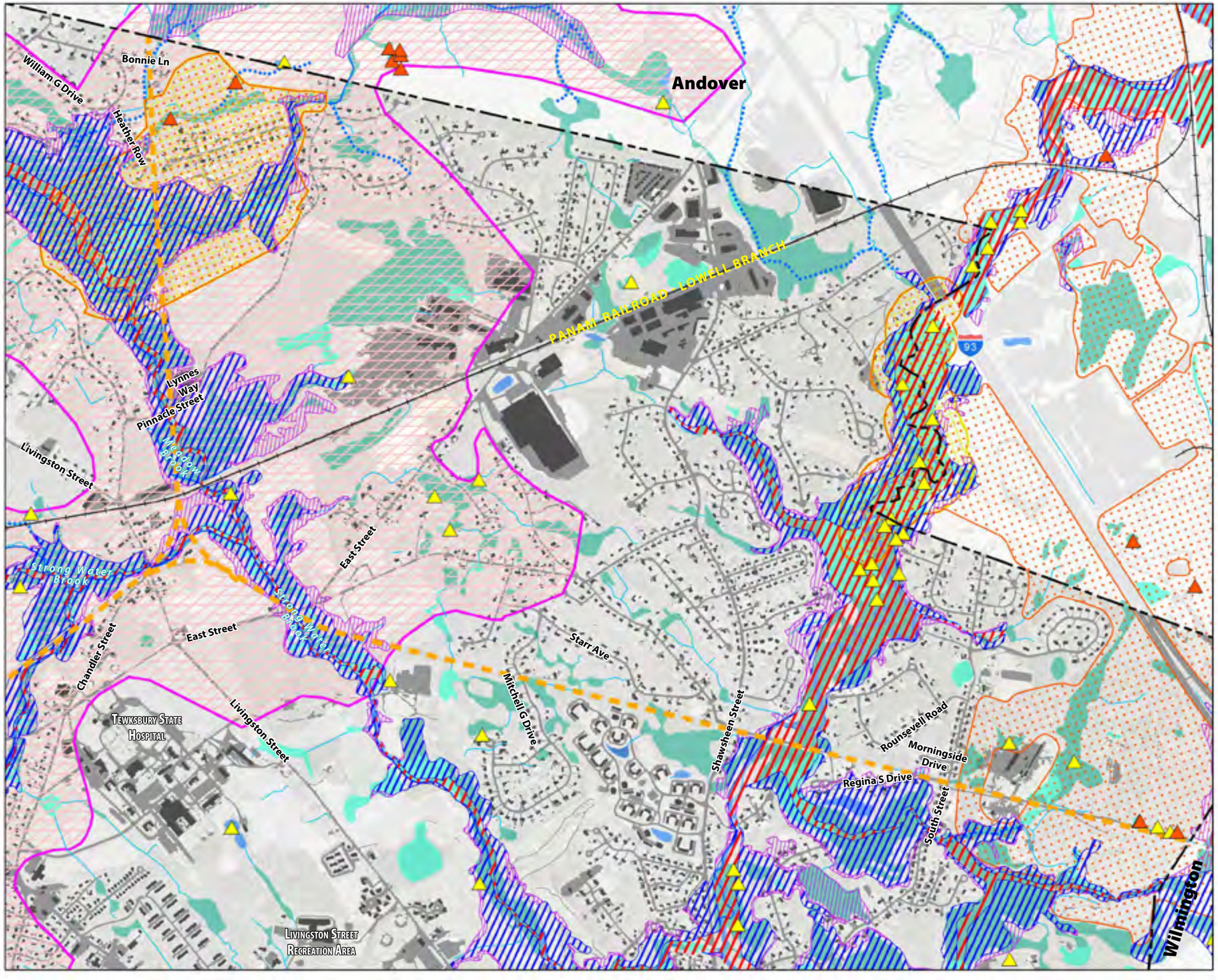


Figure 25 Hydrological and Habitat Resources (East)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

Legend

- Former Rail Corridor
- Town Boundaries
- Active Rail Line
- Town Hall
- Local Police Station
- Fire Station
- Schools
- Public Library
- Conservation Restriction

Protected and Recreational Open Space

- Recreation
- Recreation and Conservation
- Conservation
- Water Supply

MHC Historic Inventory

Historic Sites

- Preservation Restriction (Various Designation
- Undesignated
- Demolished

Historic Districts

- Undesignated

Feet
0 1,000 2,000

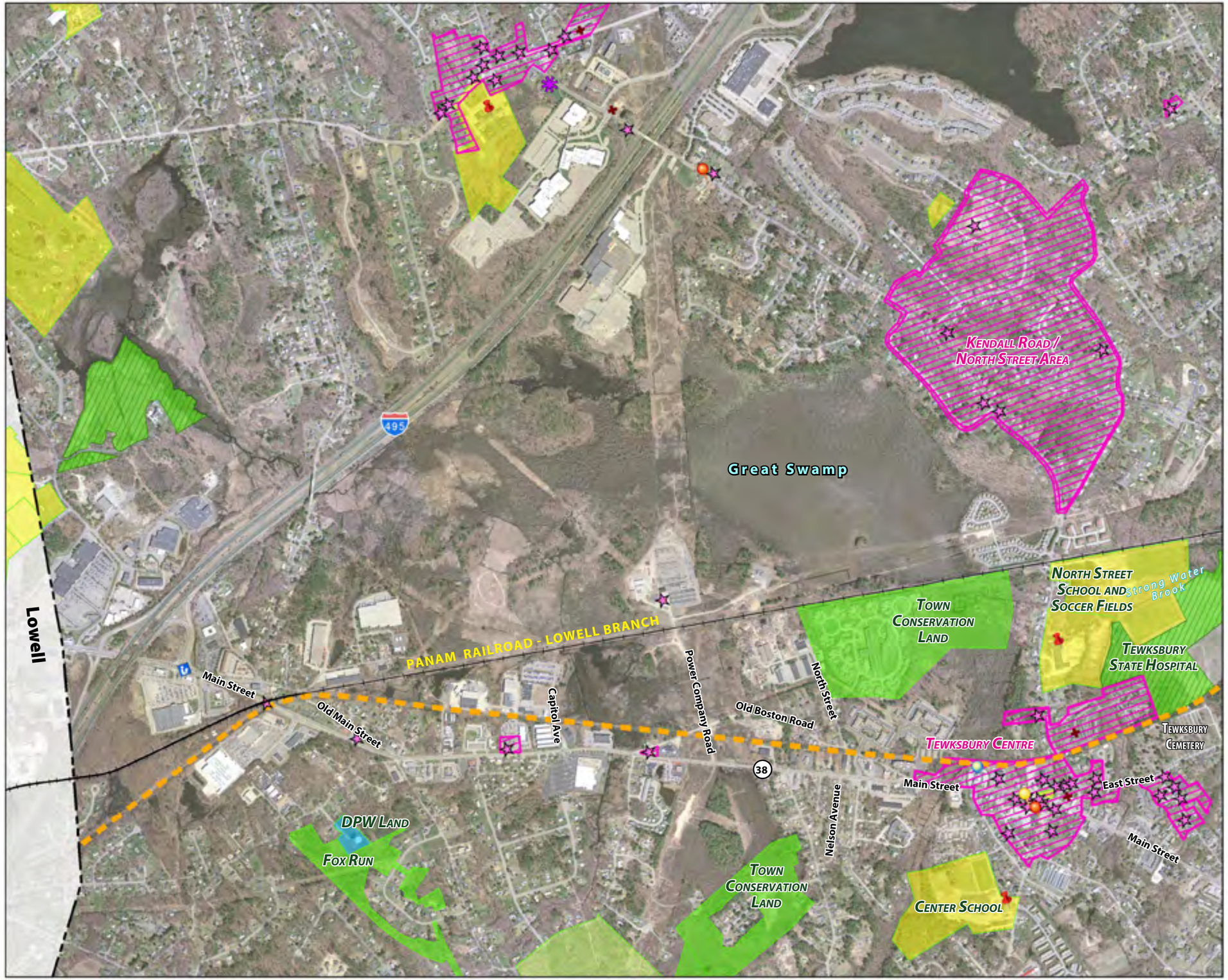
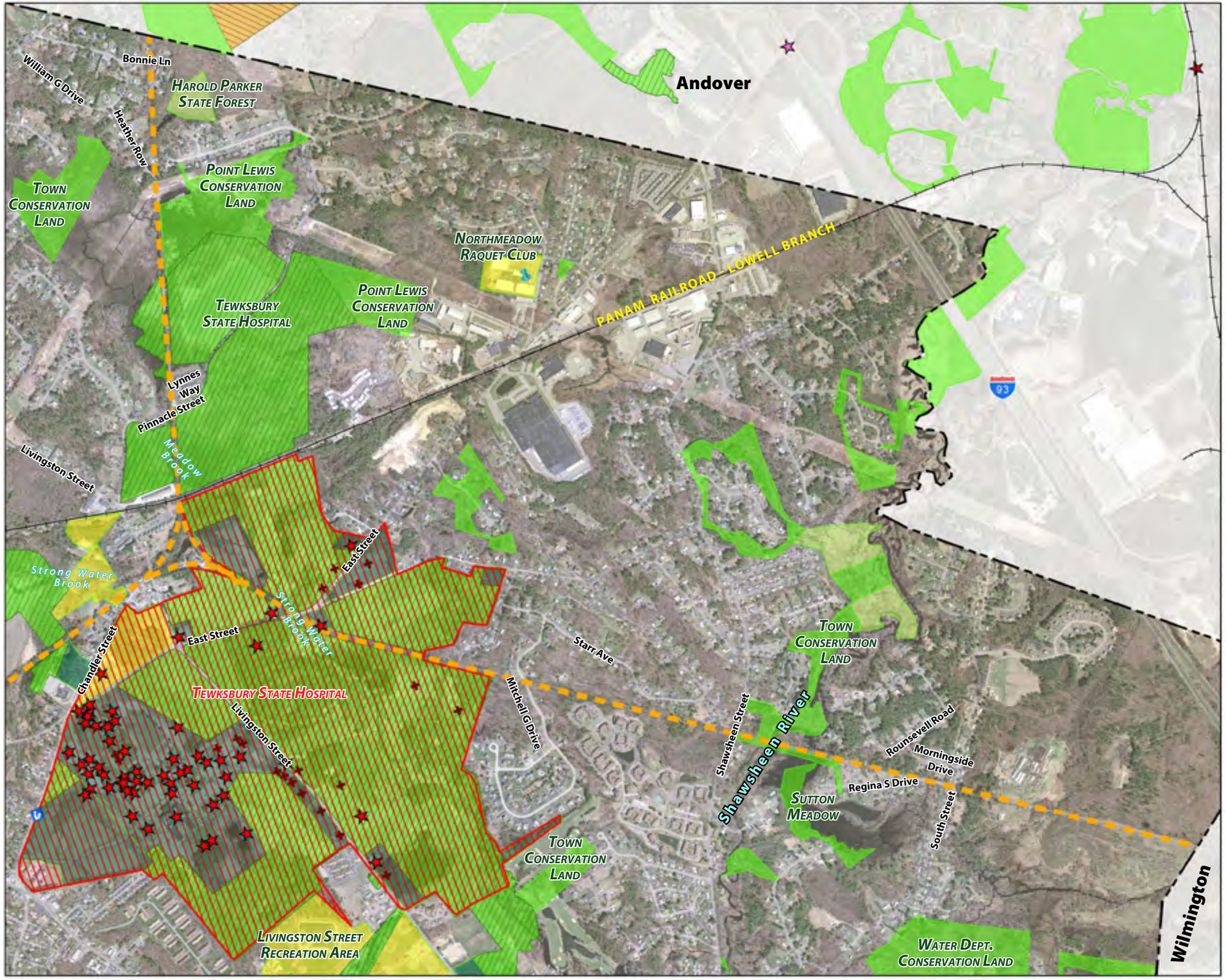


Figure 26 Protected and Recreational Open Space and Cultural Resources (West)

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography



Legend

- Former Rail Corridor
- Town Boundaries
- Active Rail Line
- Public Library
- Ice Rink
- Conservation Restriction
- Agricultural Preservation Restriction

Protected and Recreational Open Space

- Recreation
- Recreation and Conservation
- Conservation
- Agriculture
- Other

MHC Historic Inventory

Historic Sites

- National Designation
- Undesignated
- Demolished

Historic Districts

- National Designation

Feet
0 1,000 2,000

Figure 27 Protected and Recreational Open Space and Cultural Resources (East)

Tewksbury Rail Trail Feasibility Study
June 2015

Map Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division. 2013 Orthophotography

4.4 Regulatory Requirements

This chapter discusses potential permit requirements for trail construction based on the environmental resources identified in Chapter 4.3. Table 11, on the following page, outlines potential permits that the project may require.

4.4.1 Surface Water and Wetlands

As determined above, the project corridor encounters streams and wetlands in a number of locations throughout town. Work that could harm wetlands, waterways and floodplain are regulated by federal, state, and local laws. The following list provides a general overview of relevant wetland resources under jurisdiction of regulating agencies:

- **Waters of the U.S.**
  - **Rivers, Streams, Ponds, and Lakes**, regulated resource areas include:
    - **Bank** abuts and typically confines waterbodies such as intermittent and perennial streams, ponds, and lakes.
    - **Land Under Water (LUW)** is land beneath any river, perennial stream, vernal pool, freshwater wetland, wet meadow, marsh, swamp or bog
  - **Bordering Vegetated Wetlands (BVW)** are defined as freshwater wet meadows, marshes, swamps, and bogs that border on rivers, streams, ponds, and lakes.
  - **Isolated Vegetated Wetlands (IVW)** are freshwater wet meadows, marshes, swamps and bogs that do not border rivers, streams, ponds or lakes.
- **Flood Zones**
  - **Bordering Land Subject to Flooding (BLSF)** is an area which floods as a result of rising river, stream, pond, and lake waters. BLSF areas are determined by Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) mapping, which can be found online (https://msc.fema.gov/portal).
  - **Isolated Land Subject to Flooding (ILSF)** is an area which floods due to ponding of run-off or high ground water.

Bank along the study corridor is primarily associated with the Shawsheen River, Strong Water Brook, Meadow Brook, and Pinnacle Brook

- **Upland Areas**, as defined by the Town of Tewksbury Wetlands Protection Bylaw, include:
  - **25-foot No Disturb Zone** from the edge of a Wetland Resource Area
  - **50-foot No Build Zone** from the edge of a Wetland Resource Area (though mitigation for unavoidable encroachment may be permitted)
  - **100-foot buffer** to BVW, freshwater wetland, wet meadow, marsh, swamp or bog, brook, stream (intermittent or spring), pond (natural or created) or lake; BLSF, ILSF, or inundation by groundwater (six or more months of the year) or surface water (floodway).
  - **200-foot buffer** to any river, perennial stream or vernal pool (this includes areas extending from the mean annual high water line of the Shawsheen River, Strong Water Brook, Meadow Brook, and Pinnacle Brook).

At a minimum, it is anticipated the TRT would be required to comply with State and Local Wetlands Regulations. A more accurate determination of required permits can be made once wetland resources are delineated along the corridor and a preferred alternative is drafted on survey base mapping. The appropriate permit applications will need to be prepared and filed for agency review and approval before the start of project construction.

Because the study corridor has the potential to impact wetland resource areas regulated by the Tewksbury Wetlands Protection Bylaw, it is recommended that the project team consult with the Conservation Agent and Conservation Commission early in the design process. This discussion is intended to address concerns the Conservation Commission may have, regarding potential adverse environmental impacts due to installation and operation of a shared-use trail, prior to filing a Notice of Intent for construction. Additional coordination with state and/or federal agencies is also recommended if there will be work in wetlands and/or waterways.

4.4.2 Endangered Species Habitat

The Massachusetts Endangered Species Act (MESA; M.G.L. c.131A) protects rare species and their habitat. A MESA information request for the study corridor has determined that rare species have been found in the vicinity, and has outlined requirements for Massachusetts Division of Fish & Wildlife (DFW) review in compliance with MESA and the WPA (Attachment B). Therefore, a copy of the NOI will be forwarded to NHESP at the time of filing if work occurs within Estimated Habitat 435, and rare species habitat assessments, and an alternatives analysis will be prepared, to assist in MESA review.

Prior to MESA review, early in the design process, the project team should meet with DFW in order to determine ways to avoid and minimize impacts to the identified rare species and their habitats. Special considerations, such as avoiding work during particular times of year, may be required for project construction.

During MESA review, DFW will determine whether the construction and operation of a rail trail would result in the disruption and harm (a "Take") of the identified Endangered or Special Concern Species. If it is determined that the project will Take Endangered Species Habitat, the project would require a Conservation and Management Permit (CMP) (321 CMR 10.23) in order to proceed to construction.

4.4.3 Archeological and Historical Sites and Districts

If the project requires state or federal funding, licenses or permits, it must be reviewed by the Massachusetts Historical Commission (MHC) in compliance with Federal Section 106 Review, under the National Historic Preservation Act of 1966 (16 USC 470), and/or State Chapter 254 Review (MGL Chapter 9 §26-27C). In this case, a Project Notification Form (PNF) would be prepared for MHC review to determine whether the project is likely to have an adverse effect on significant historic or archeological resources. The PNF should be submitted as early as possible in the project planning process.

4.4.4 Cumulative Impacts

If federal funding is used for the trail project, then it will require a Programmatic Categorical Exclusion (CE) Determination to comply with the National Environmental Policy Act (NEPA). CEs are actions which individually or cumulatively do not involve significant social, economic or environmental impacts, and are therefore, categorically excluded from the requirement to prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

If state funding or permits are required to construct the trail, then it will be required to comply with the Massachusetts Environmental Policy Act (MEPA). If subject to the act, the project could exceed review thresholds outlined in the MEPA Regulations (301 CMR 11.03) and require filing an Environmental Notification Form (ENF). It is not anticipated that the project will exceed any review thresholds requiring the preparation of an Environmental Impact Report (EIR).

Table 11 Public Agencies and Regulations for the Protection of Wetland Resource Areas

Regulating Agency	*Laws and Regulations*	*Potential Permits*	*Permit Thresholds Relevant to Rail Trail Study*
Federal - Army Corps of Engineers (ACOE)	Federal Clean Water Act (33 USC 1251 §404) / Massachusetts General Permit	Category 1 Notification Form - for activities in Waters of the U.S. (rivers, streams, lakes, ponds and wetlands)	<5,000 square feet inland waterway/wetland impacts (temporary or permanent)
		Category 2 Permit – for activities in Waters of the U.S.	5,000 square feet – 1 acre inland waterway/wetland impacts (temporary or permanent); Bank stabilization >100 ft long; River, stream, brook& wetland crossings that do not comply with the Conditions of the Massachusetts General Permit
		Individual Permit – for activities in Waters of the U.S.	>1 acre inland waterway/wetland impacts (temporary or permanent)
Federal – Environmental Protection Agency (EPA)	Federal Clean Water Act (33 USC 1251 §402 / 40 CFR 123)	National Pollutant Discharge Elimination System (NPDES) permit and Stormwater Pollution Prevention Plan (SWPPP)	Required for >1 acre of earth disturbance – includes documentation of eligibility, a Notice of Intent, SWPPP detailing construction activities, erosion control measures, and inspection schedules to be implemented during construction to ensure that the construction activities do not have an adverse impact on wetlands and waterways.
State - Executive Office of Energy and Environmental Affairs (EEA)	Massachusetts Environmental Policy Act (MGL c.30 §61-62H / 301 CMR 11.00)	MEPA Environmental Notification Form (ENF)	A MEPA Certificate is required when a project meets or exceeds review thresholds identified for impacts to resources such as wetlands, endangered species habitat, historical resources, among others (301 CMR 11.03).
State - Department of Environmental Protection (MassDEP)	Federal Clean Water Act (33 USC 1251 §401) and Massachusetts Clean Water Act (MGL c.21 §26-53 / 314 CMR 4.00)	Water Quality Certification for Dredging Projects	>100 cubic yards of dredging or discharge to Waters of the U.S.
		Water Quality Certification for Fill and Excavation Projects	>5,000 square feet cumulative loss of BVW, IVW and LUW
	Federal Clean Water Act (33 USC 1251 §305(b)/303(d)) and Massachusetts Clean Water Act (MGL c.21)	Impaired Waters and Total Maximum Daily Loads Program	Because the potential rail trail would construct new impervious pavement adjacent to impaired waterways, MassDEP will need to review the project's stormwater design to ensure it will not contribute to further pollution to these waters. This will likely be reviewed through the NOI process listed below.
	Wetlands Protection Act (MGL c.131 §40 / 310 CMR 10.00)	Request for Determination of Applicability (RDA) / Notice of Intent (NOI) / Stormwater Report	Administered at local level - see below.
Local – Tewksbury Conservation Commission	Tewksbury Wetlands Protection Bylaw (Section 18.04) / Tewksbury Wetlands Protection Regulations	Notice of Intent (NOI)	NOI form and documentation are required when proposing alteration to BVW, IVW (5,000 sf or larger), Vernal Pools, Bank, LUW, BLSF, ILSF, 25-foot No Disturb Zone, 50-foot No Build Zone, 100-foot buffer zone, or 200-foot buffer zone. In accordance with Volume 1 of the Massachusetts Stormwater Handbook and 310 CMR 10.05(6)(m), "footpaths, bike paths, and other paths for pedestrian and/or non-motorized vehicle access" need to comply with the Stormwater Management Standards "to the maximum extent practicable". The goal of stormwater design should be to maintain existing swales and drainage patterns, allow rainwater to percolate into the soil, and avoid new point source discharges.

5.0 REFERENCES

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ATTACHMENT A

Selected Pages From

Rail-Trail Maintenance & Operation:

Ensuring the Future of Your Trail - A Survey of 100 Rail-Trails.

Rails-to-Trails Conservancy (RTC) Northeast Regional Office

Getting It Done


Armstrong Trail, Pa. (Allegheny Valley Land Trust)

VOLUNTEERS

Volunteers are at the heart of almost every trail maintenance effort. Even trails fortunate enough to have some paid maintenance staff will use volunteers whenever possible. This is the best way to stretch scarce trail maintenance dollars as far as possible. Here are some tips for using and finding volunteers:

- Volunteers should always work under the direction and supervision of a responsible adult. This person should preferably represent the entity that will be liable if any mishaps occur.
- Volunteers should not do anything that runs contrary to your insurance coverage, private property rights, laws, ordinances, regulations, etc.
- Power tools and equipment should not be operated by minors or in the presence of unattended children.
- Volunteers should not engage in any police or medical functions unless they are properly certified to do so.

If a trail is owned or managed by a nonprofit group, the most likely source of volunteers is the group's members. These individuals can get stretched thin, however, so it's a good idea to tap other sources of labor. Some of these include:

- Boy or Girl Scout troops and individual Eagle Scout candidates.
- School and church groups (youth and adult).
- Adult service clubs (Rotary, Kiwanis, Lions, etc.).
- The county court system or corrections department can often provide individuals who are incarcerated or have mandatory community service sentences.
- Alternative education programs for at-risk youth.
- United Way Day of Caring.

The more voluntary a person's participation is, the more he will want his time put to good use with a tangible result, such as planting a garden or building a picnic area, rather than picking up trash.

Another way to spread the maintenance load is through an adopt-a-trail program. This follows the adopt-a-highway model that many departments of transportation have. A business, community group, or even a single individual or family, agrees to take on certain routine maintenance functions for a section of the trail. Much like the highway program, "adopters" aren't going to fix the trail surface. But they can cut the grass, keep the trail clean and attractive, and inform the


Baltimore & Annapolis Rail-Trail, Md. (Dave Dionne)

All: Capital Area Greenbelt, Pa. (Courtesy of Rails-to-Trails Conservancy)

regular trail maintenance organization of problems and hazards before they get out of hand. With existing skills or a modicum of instruction, volunteers can do almost everything associated with the maintenance and operation of a trail. Table 15 below lists some common maintenance tasks that volunteers may or may not be able to perform, and suggests some sources of assistance for more difficult tasks.

Table 15: Common Maintenance Tasks for Volunteers

VOLUNTEERS CAN MOST LIKELY	VOLUNTEERS MAY NOT BE ABLE TO	TO GET HELP WITH THIS TASK
Keep the trail clear of trash and debris.	Haul material to a disposal facility.	Contact your local government or waste hauler.
Clear brush and trees.	Dispose of the material.	Borrow or rent a chipper.
Plant and maintain trees, shrubs and flowers and do most gardening and landscaping tasks.	Provide the items to be planted.	Get donated or discounted plant materials from a local nursery or home center. Establish an inventory of donated hand tools.
Operate mowers, trimmers and chain saws.	Supply their own tools.	Establish an inventory of donated power tools.
Operate a tractor, loader or bobcat.	Operate specialized heavy equipment like a dozer, grader or roller.	Ask your local road crew or hire a paid contractor.
Make minor repairs to non-asphalt trails.	Lay asphalt or operate a paving machine.	
Keep drainage structures clear.	Dig a trench and install pipes or culverts.	
Perform surface cleaning of restrooms.	Remove waste from portable toilets and restrooms.	Hire a paid contractor.
Install signs, gates, bollards and fences.	Manufacture same.	Purchase using donated funds, or get donated or discounted materials from a lumber yard or home center.
Build and install picnic tables, benches, kiosks and other wood structures.	Provide materials.	
Bridge decking and minor bridge and tunnel maintenance.	Structural inspection and maintenance of bridges and tunnels.	Hire a professional engineer and paid contractor.

GETTING THE MOST FROM YOUTH VOLUNTEERS

- Have a goal for each outing.
- Youth want to feel that their tasks have a purpose.
- Emphasis the goal—accomplishing the goal is very important.
- Explain the tasks required to achieve the goal.
- Keep tasks short and simple, 2–3 hours at most, before losing attention.
- Change the goals and tasks from month to month to hold interest.
- Include hands on training for all tasks, no matter how simple.
- Stress safety. Be over-cautious and lead by example in using protective gear and proper techniques.
- Keep everyone involved.
- Include a short (one minute) educational talk.
- Include a new tool or skill as part of each project.
- Do not be afraid to discipline, which means "teach," not "punish."
- Thank them for improving the community and society.
- Many just want to be attached to something or someone positive.
- Emphasis that the trail is for public use and they are the public.
- Give them the sense that they benefit from their accomplished goals.
- Be ready for surprises.
- Look for and praise the positive.

EQUIPMENT

Aside from major surfacing and resurfacing projects, most of the equipment needed for trail maintenance is within easy reach of trail maintenance organizations. If a county or municipality maintains the trail, there is a good chance that the park or road department will already own everything needed. Even volunteer groups have a good head start, as many of the tools are the same as what the average home owner uses for yard maintenance. Tools can be owned outright as a result of donation or purchase, or they can be borrowed or rented as needed. Tools and equipment that the average trail maintenance organization should have access to include the list at the right.

HAND TOOLS

- Shovel—flat and round
- Rake—garden and leaf
- Hoe
- Cultivator
- Broom
- Digging bar
- Tamper
- Axe
- Hand saw
- Pruners and lopers
- Buckets and trash bags
- Rope or chain
- Carpentry tools (hammer, saw, screw drivers, etc.) can usually be brought by volunteers when required for a project.

POWER TOOLS

- Walk-behind mower
- String trimmer
- Chain saw
- DR Trimmer or sickle-bar mower

POWER EQUIPMENT

- Lawn tractor (mower)
- Garden tractor with attachments (mower, blade, loader, sickle-bar)

LARGER POWER EQUIPMENT

(most likely rent or have contractor provide)

- Bobcat
- Chipper
- Loader/backhoe
- Dump truck
- Grader
- Bulldozer
- Paving machine
- Roller

Appendix 1 – Resources for Trail Managers

There's a vast amount of information available for trail managers. This isn't intended to replace, supersede or duplicate any of those efforts, but merely to suggest a good direction in which to start.

Rails-to-Trails Conservancy (RTC) maintains four Web sites and a listserv:

www.railtrails.org — General information about RTC.
www.trailsandgreenways.org — Information for trail planners, builders and maintainers.
www.ntec.org — National Transportation Enhancements Clearinghouse.
www.traillink.com — Trail-finder service.

In addition, RTC maintains the Trails and Greenways listserv. This is an e-mail forum for the discussion of trails and greenways issues. You can ask a question and have it instantly distributed to hundreds of your colleagues across the country. It's a quick and easy way to get assistance, advice and a variety of perspectives.

You can subscribe to the listserv by sending an e-mail to trailsandgreenways-subscribe@yahoogroups.com. You will receive a welcome message with instructions on how to access listserv archives and other advanced features by registering with Yahoo, if you choose to do so.

American Trails — www.americantrails.org
National Trails Training Partnership — www.nttp.net
American Hiking Society — www.americanhiking.org
National Trails Day — www.nationaltrailsday.org

RTC, American Trails (which also hosts National Trails Training Partnership), and American Hiking Society (which also facilitates National Trails Day and the National Trails Directory) all provide numerous additional resource links.

For resources more specifically related to the region covered by this study, please visit RTC's Northeast Regional Office at www.railtrails.org/field/northeast/default.asp.

Appendix 2 – Maintenance Schedules

Twenty-five trails responded with more detailed information about when various maintenance tasks are done. Topping the list of daily tasks were patrols by police and non-police agencies, followed by cleaning of restrooms. On a weekly basis, trails often do light clean-up work on the trail and trailheads, empty trash cans, do additional restroom cleaning, and cut the grass. Trails that don't have the resources to get to these things on a weekly basis do them monthly. It is quite common, especially for all-volunteer operations, to have monthly work days. Once a year seems to be a good frequency for applying herbicides, cleaning culverts, inspecting bridges, and catching up on non-critical repairs. Hands down, "as needed" is the most common frequency for all maintenance tasks except for trash and toilets. Here is the table of responses:

Table 16: Frequency of Common Maintenance Tasks

Maintenance Activity	How often is it done?						
	Day	Week	Month	Quarter	Year	As Needed	Other
Repaving of asphalt trail						5	
Coating or sealing of asphalt trail						5	5 years
Pothole repair on asphalt trail						5	
Snow removal from asphalt trail						6	
Surface cleaning of asphalt trail		1	2	1		4	
Pavement markings maintenance and replacement					2	3	
Resurface non-asphalt trail						12	
Grade non-asphalt trail					2	8	
Pothole repair and other patches on non-asphalt trail				1		13	
Snow removal from non-asphalt trail						2	
Surface cleaning of non-asphalt trail				1		5	
Keep trail-side land clear of trash and debris	1	4	5		3	9	
Mowing		7	5	1	2	6	
Leaf removal			2		3	8	
Tree pruning		1	1		3	17	
Tree removal			1		1	17	
Invasive species removal			1			12	
Planting new vegetation					1	7	
Application of herbicides or pesticides					5	6	
Cleaning of drainage channels and culverts					4	18	
Surface maintenance of parking areas		2		1	3	12	
General maintenance of trailheads (litter clean-up, etc.)	1	6	1		1	9	
Landscaping/gardening at trailheads		4	2	1	2	4	
Empty trash cans at trailheads		2	3	1			2

Maintenance Activity	How often is it done?						
	Day	Week	Month	Quarter	Year	As Needed	Other
Maintenance of stationary toilets at trailheads (clean, empty, etc.)	4	2				1	
Maintenance of portable toilets at trailheads (clean, empty, etc.)		6				2	
Empty trash cans along trail		4				1	
Maintenance of stationary toilets along trail (clean, empty, etc.)	1	2					
Maintenance of portable toilets along trail (clean, empty, etc.)		2					
Maintenance of informational kiosks (repairs, etc.)		1	3		1	8	
Maintenance of picnic tables, benches, etc.				1		10	
Updating information in informational kiosks		2	1	2	1	8	
Installation of signs					1	19	
Repair/maintenance of signs					3	17	
Installation of pavement markings						4	1
Maintenance of pavement markings						3	
Patrols by police agency	7	1				5	random
Patrols by non-police agency (e.g. trail watch)	5	3				1	ongoing
Recovery from illegal acts such as dumping and vandalism	3		1		1	11	
Installation of lighting						1	
Maintenance of lighting						2	
Installation of emergency call boxes							—
Maintenance of emergency call boxes							—
Installation of gates, bollards and fencing						11	
Maintenance of gates, bollards and fencing			1			16	
Bridge, tunnel, underpass and crossing inspection	1	1		1	3	6	2-3 years
Bridge redecking						14	
Paint/stain/treat bridge deck or structure					1	6	
General bridge maintenance					2	14	
Tunnel lighting maintenance							—
Tunnel open/closed status							—
Paint tunnel/underpass walls and ceiling						2	
General tunnel/underpass maintenance						4	
Railroad grade crossing maintenance					1	4	
Road grade crossing maintenance		1			1	11	

The Chester County (Pennsylvania) Parks and Recreation Department submitted this detailed maintenance schedule for the Struble Trail:

Activity	January					February					March					Total
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	Hours
Mowing														5		5
Trimming														5		5
Trash	2	2	2	2		2	2	2	2		2	2	2	2	2	26
Weeding															2	2
Invasive spraying																0
Bush hog																0
Signage																0
Fence repair												10				10
Pruning																0
Invasive pruning												20				20
Designated projects																0
Culverts																0
Gates																0
Bridge inspection									0.5							0.5
Grade ditches																0
Crosswalks																0
Trail surface																0
Flower bed planting																0
Storm damage																0
Vandalism																0

Activity	April					May					June					Total
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	Hours
Mowing	5		5	5		5	5	5	5	5	5	5	5	5		60
Trimming	5		5	5		5	5	5	5	5		5	5	5	5	60
Trash	2	2	2	2		2	2	2	2	2	2	2	2	2		26
Weeding				2					2						2	6
Invasive spraying						10					10					20
Bush hog				16												16
Signage									20							20
Fence repair												10				10
Pruning			40													40
Invasive pruning																0
Designated projects											120					120
Culverts																0
Gates	6					6										12
Bridge inspection																0
Grade ditches																0
Crosswalks	6															6
Trail surface										16						16
Flower bed planting		10														10
Storm damage																0
Vandalism																0

Activity	July					August					September					Total
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	Hours
Mowing	5		5		5	5		5	5			5	5		5	45
Trimming	5		5		5	5		5	5			5	5		5	45
Trash	2	2	2	2	2	2	2	2	2		2	2	2	2	2	28
Weeding				2					2					2		6
Invasive spraying	10					10					10					30
Bush hog											16					16
Signage								20								20
Fence repair							10									10
Pruning												40				40
Invasive pruning																0
Designated projects								120								120
Culverts																0
Gates																0
Bridge inspection																0
Grade ditches																0
Crosswalks																0
Trail surface																0
Flower bed planting																0
Storm damage																0
Vandalism																0

Activity	October					November					December					Total
	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	W1	W2	W3	W4	W5	Hours
Mowing		5		5												10
Trimming		5		5												10
Trash	2	2	2	2		2	2	2	2	2	2	2	2	2		26
Weeding																0
Invasive spraying			10													10
Bush hog																0
Signage																0
Fence repair				10												10
Pruning																0
Invasive pruning							20									20
Designated projects																0
Culverts							8									8
Gates																0
Bridge inspection																0
Grade ditches						16										16
Crosswalks																0
Flower bed planting																0
Trail surface																0
Storm damage																0
Vandalism																0

Appendix 3 — Budgets

As discussed in the narrative and demonstrated in the maintenance schedules in Appendix 2, trail maintenance is very much an ad-hoc business. Maintenance is done "as needed" and as funds present themselves — an approach that does not lend itself to meticulous budgeting. A couple of trails were kind enough to submit detailed budgets, and those follow.

The Chester County (Pennsylvania) Parks and Recreation Department submitted this detailed budget for the Struble Trail:

Activity	Times	Man Hours	Wages	Equipment Hours	Equipment Costs	Materials Costs	Transportation Costs	Total
Mowing	24	120	$1,957	96	$459	$0	$408	$2,864
Trimming	24	120	$1,380	96	$86	$0	$0	$1,466
Trash	52	110	$743	0	$0	$30	$884	$1,657
Weeding	7	14	$133	0	$48	$30	$0	$211
Invasive Spraying	6	60	$682	0	$40	$60	$102	$884
Bush Hog	2	32	$431	30	$252	$0	$36	$719
Signage	2	40	$540	0	$20	$200	$34	$794
Fence Repair	4	40	$454	0	$20	$300	$68	$842
Pruning	2	80	$1,271	40	$80	$0	$34	$1,385
Invasive Pruning	2	40	$340	20	$40	$0	$34	$414
Designated Projects	2	240	$3,814	80	$672	$1,400	$136	$6,022
Gates	2	12	$162	0	$10	$10	$0	$182
Culverts	1	8	$91	0	$10	$20	$17	$138
Bridge Inspection	1	0.5	$10	0	$0	$0	$0	$10
Grade ditches	1	16	$182	0	$10	$10	$17	$219
Crosswalks	1	6	$60	0	$4	$10	$17	$100
Trail Surface	1	16	$182	0	$5	$30	$17	$234
Flower Bed Planting	1	10	$95	0	$5	$120	$17	$237
Storm Damage	4	30	$341	10	$21	$50	$68	$480
Vandalism	3	20	$318	0	$10	$240	$51	$619
							Grand Total	**$19,677**

The following was submitted for the Heritage Rail Trail County Park in York, Pennsylvania. The trail was developed by the York County Rail-Trail Authority, the only entity of its kind devoted exclusively to rail-trail development. The trail is now maintained by the York County Parks and Recreation Department.

Maintenance Activity	Approximate annual labor cost	Approximate value of donated services	Approximate annual equipment & material cost	Total annual cost
Resurface non-asphalt trail	$70,000			$70,000
Grade non-asphalt trail				$0
Pothole, repair and other patches on non-asphalt trail	$1,000			$1,000
Snow removal from non-asphalt trail				$0
Surface cleaning of non-asphalt trail				$0
Keep trailside land clear of trash and debris	$5,200	$5,200		$10400
Mowing	$25,000		$9,320	$34,320
Leaf removal	$1,000			$1,000
Tree pruning	$3,200		$1,800	$5,000
Tree removal				$0
Invasive species removal				$0
Planting new vegetation				$0
Application of herbicides or pesticides	$4,000			$4,000
Cleaning of drainage channels and culverts	$3,000			$3,000
Surface maintenance of parking areas				$0
General maintenance of trailheads (litter clean-up, etc.)	$1,500	$1,500		$3,000
Landscaping / gardening at trailheads	$4,000		$4,000	
Empty trash cans at trailheads	$1,500			$1,500
Maintenance of stationary toilets at trailheads (clean, empty, etc.)	$9,000		$1,000	$10,000
Maintenance of portable toilets at trailheads (clean, empty, etc.)	$2,400			$2,400
Empty trash cans along trail				$0
Maintenance of stationary toilets along trail (clean, empty, etc.)				$0
Maintenance of portable toilets along trail (clean, empty, etc.)				$0
Maintenance of informational kiosks (repairs, etc.)	$1,000			$1,000
Maintenance of picnic tables, benches, etc.	$250		$250	$500
Updating information in informational kiosks	$500			$500
Installation of signs	$3,000		$1,200	$4,200
Repair/maintenance of signs	$1,000			$1,000
Installation of pavement markings	$3,300		$4,500	$7,800
Maintenance of pavement markings	$700		$700	$1,400
Patrols by police agency	$20,000		$12,000	$32,000
Patrols by non-police agency (e.g. trail watch)		$3,000		$3,000
Recovery from illegal acts such as dumping and vandalism				$0
Installation of lighting				$0
Maintenance of lighting				$0
Installation of emergency call boxes				$0
Maintenance of emergency call boxes				$0
Installation of gates, bollards and fencing				$0
Maintenance of gates, bollards and fencing	$3,500		$1,400	$4,900
Bridge, tunnel, underpass and crossing inspection	$2,500			$2,500
Bridge redecking				$0
Paint/stain/treat bridge deck or structure				$0
General bridge maintenance	$50,000			$50,000
Tunnel lighting maintenance				$0
Tunnel open/closed status				$0
Paint tunnel/underpass walls and ceiling				$0
General tunnel/underpass maintenance				$0
Railroad grade crossing maintenance	$3,000			$3,000
Road grade crossing maintenance	$2,200			$2,200
Totals	**$146,750**	**$13,700**	**$32,170**	**$192,620**

The following budget was submitted for the Capital Area Greenbelt in Harrisburg, Pennsylvania.

Maintenance Activity	Labor cost	Donated services	Equipment & material cost materials	Donated equipment & cost for activity	Approximate total annual
Resurface non-asphalt trail		$2,000	$2,000	$3,500	$7,500
Grade non-asphalt trail					$0
Pothole repair and other patches on non-asphalt trail		$1,000	$500	$1,500	$3,000
Snow removal from non-asphalt trail					$0
Surface cleaning of non-asphalt trail					$0
Keep trailside land clear of trash and debris		$1,000	$1,000		$2,000
Mowing		$2,000	$1,000	$2,000	$5,000
Leaf removal					$0
Tree pruning					$0
Tree removal	$500	$800	$200	$1,000	$2,500
Invasive species removal		$1,000	$500	$800	$2,300
Planting new vegetation		$3,000	$2,000	$3,000	$8,000
Application of herbicides or pesticides		$1,000	$300	$1,000	$2,300
Cleaning of drainage channels and culverts		$500	$200	$500	$1,200
Surface maintenance of parking areas	$2,000	$1,000	$300	$1,000	$4,300
General maintenance of trailheads (litter clean-up, etc.)		$300	$100	$500	$800
Landscaping / gardening at trailheads		$3,000	$2,000	$3,000	$8,000
Empty trash cans at trailheads	$1,500		$2,000	$2,000	$5,500
Maintenance of stationary toilets at trailheads (clean, empty, etc.)					$0
Maintenance of portable toilets at trailheads (clean, empty, etc.)					$0
Empty trash cans along trail					$0
Maintenance of stationary toilets along trail (clean, empty, etc.)					$0
Maintenance of portable toilets along trail (clean, empty, etc.)					$0
Maintenance of informational kiosks (repairs, etc.)					$0

Maintenance Activity	Labor cost	Donated services	Equipment & material cost materials	Donated equipment & cost for activity	Approximate total annual
Maintenance of picnic tables, benches, etc.					$0
Updating information in informational kiosks		$300	$100	$200	$600
Installation of signs		$200	$300	$500	$1,000
Repair/maintenance of signs		$200	$300	$500	$1,000
Installation of pavement markings					$0
Maintenance of pavement markings					$0
Patrols by police agency	$30,000				$30,000
Patrols by non-police agency (e.g. trail watch)					$0
Recovery from illegal acts such as dumping and vandalism					$0
Installation of lighting	$100		$100		$200
Maintenance of lighting	$200		$500		$700
Installation of emergency call boxes					$0
Maintenance of emergency call boxes					$0
Installation of gates, bollards and fencing	$1,000	$200	$100	$20,000	$21,300
Maintenance of gates, bollards and fencing	$300	$10,000	$200	$15,000	$25,500
Bridge, tunnel, underpass and crossing inspection	$50	$50	$50	$50	$200
Bridge redecking					$0
Paint/stain/treat bridge deck or structure	$300	$600	$300	$1,000	$2,200
General bridge maintenance	$100	$500	$1,000	$1,000	$2,600
Tunnel lighting maintenance					$0
Tunnel open/closed status					$0
Paint tunnel/underpass walls and ceiling					$0
General tunnel/underpass maintenance					$0
Railroad grade crossing maintenance					$0
Road grade crossing maintenance					$0
Totals	**$36,550**	**$28,550**	**$16,050**	**$58,050**	**$139,200**

ATTACHMENT B
State-Listed Species Letter, 25 November 2014.
Massachusetts Division of Fisheries & Wildlife Natural Heritage and Endangered Species Program

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

November 25, 2014

Hillary King
Fay, Spofford & Thorndike
5 Burlington Woods
Burlington MA 01803

RE: Project Location: former Lowell/Lawrence RR & former Salem/Lowell RR
Town: TEWKSBURY
NHESP Tracking No.: 14-33859

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitats 523 & 1459* (PH 523, PH 1459) and *Estimated Habitat 435* (EH 435) as indicated in the *Massachusetts Natural Heritage Atlas* (13th Edition). Our database indicates that the following state-listed rare species have been found in the vicinity of the site:

Priority Habitat 1459

Scientific name	Common Name	Taxonomic Group	State Status
Callophrys irus	Frosted Elfin	Butterflies and Moths	Special Concern
Apodrepanulatrix liberaria	New Jersey Tea Inchworm	Butterflies and Moths	Endangered
Euchlaena madusaria	Sandplain Euchlaena	Butterflies and Moths	Special Concern

Priority Habitat 523 & Estimated Habitat 435

Scientific name	Common Name	Taxonomic Group	State Status
Ambystoma laterale	Blue-Spotted Salamander	Amphibian	Special Concern

The species listed above are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). Fact sheets for most state-listed rare species can be found on our website (www.mass.gov/nhesp).

Please note that projects and activities located within Priority and/or Estimated Habitat **must** be reviewed by the Division for compliance with the state-listed rare species protection provisions of MESA (321 CMR 10.00) and/or the WPA (310 CMR 10.00).

Wetlands Protection Act (WPA)

If the project site is within Estimated Habitat and a Notice of Intent (NOI) is required, then a copy of the NOI must be submitted to the Division so that it is received at the same time as the local conservation commission. If the Division determines that the proposed project will adversely affect the actual

Division of Fisheries and Wildlife
Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

Resource Area habitat of state-protected wildlife, then the proposed project may not be permitted (310 CMR 10.37, 10.58(4)(b) & 10.59). In such a case, the project proponent may request a consultation with the Division to discuss potential project design modifications that would avoid adverse effects to rare wildlife habitat.

A streamlined joint MESA/WPA review process is available. When filing a Notice of Intent (NOI), the applicant may file concurrently under the MESA on the same NOI form and qualify for a 30-day streamlined joint review. For a copy of the NOI form, please visit the MA Department of Environmental Protection's website: http://www.mass.gov/dep/water/approvals/wpaform3.doc.

MA Endangered Species Act (MESA)

If the proposed project is located within Priority Habitat and is not exempt from review (see 321 CMR 10.14), then project plans, a fee, and other required materials must be sent to Natural Heritage Regulatory Review to determine whether a probable "take" under the MA Endangered Species Act would occur (321 CMR 10.18). Please note that all proposed and anticipated development must be disclosed, as MESA does not allow project segmentation (321 CMR 10.16). For a MESA filing checklist and additional information please see our website: www.mass.gov/nhesp ("Regulatory Review" tab).

We recommend that rare species habitat concerns be addressed during the project design phase prior to submission of a formal MESA filing, as avoidance and minimization of impacts to rare species and their habitats is likely to expedite endangered species regulatory review.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Lauren Glorioso, Endangered Species Review Assistant, at (508) 389-6361.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

TEWKSBURY RAIL TRAILS